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Table of Contents

Page

Greeting to the 1932 Convention of the American Physiotherapy Association. *Herman C. Schumm, M. D.* 223

Physical Therapy: A Brief Synopsis of the Action of Common Modalities. *T. E. P. Gocher, M. D.* 224

Chronic Arthritis. *Captain H. P. Marvin* 227

Fractures. *Ruth E. Dunn, R. N.* 229

Rhythm and Educational Dancing in the Treatment of the Posture Case. *Catherine A. Worthingham* 233

Practical Experiences in the Application of Muscle Training in the After Care of Poliomyelitis, *Marian Ballantyne, R. N.* and *Winifred Johnston Hearn, B. S.* 241

Editorials 243

Symposium on Abdominal and Pelvic Conditions 245

Body Mechanics in Relation to Ptosis of the Abdominal Organs and to Abdominal Pain and Tenderness, *John Berton Carnett, M. D.* and *William Bates, M. D.* 246

Internal Hydrotherapy, *Emily J. Griffin* 250

Dysmenorrhea and Exercise. *Lorraine Frost* 251

Some Physical Therapeutic Methods in the Treatment of Constipation. *G. G. Deaver, M. D.* 254

Comments. *Edmund Jacobson, M. D.* 257

Abstracts. *John S. Coulter, M. D.* 263

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Greeting to the 1932 Convention of the American Physiotherapy Association

By Herman C. Schumn, M. D.

May I express my appreciation of the honor and opportunity afforded me to welcome this association to Milwaukee? It is a pleasure to which I have long looked forward and which is doubled by two facts: the first being that I feel that I have so many personal friends among your members, and one always looks forward to welcoming his friends to his home: the second is that I have known this organization even before its inception and one always enjoys the sense of satisfaction, and then being able to express this feeling, that comes with witnessing the rapid growth and extraordinary development of an organization that has proven itself of such human service as has this association.

Among the notable features of this association has been its rapid development, the high level of scientific knowledge and the spirit of helpfulness it has brought out in its individual members. This growth and development may be illustrated by my personal experience, which I consider is that of an average member of the medical profession, to whom physiotherapy has meant so much.

While many of the elements of physiotherapy have been known for a long time by a certain selected few, to the average medical man it was almost a closed book.

When I graduated from medical school, a period which to me does not seem so very remote, my knowledge of this valuable branch of therapeutics consisted of the facts that there were several types of baths: salt, carbon dioxide and maybe another that could be used in certain conditions. Also, that heat and massage were sometimes useful, especially in conditions where joints were stiff. This knowledge, vague and almost valueless, was secured after an afternoon spent in going through the physiotherapy department of my university, one of the few in existence at that time.

After a two years' interneship in a moderately large active surgical hospital, my knowledge of physiotherapy was even less than when I graduated from college.

In 1916 I had the pleasure of being with an American Red Cross unit in Austria and it was then for the first time that I could see the wide use and real practical value of your chosen field. The Austrians and Germans, as well as the Allies, were beginning to use massage, hot baths and hot wax soaks for healed gunshot wounds to extremities, and there for the first time I saw the use of the continuous bath for patients with complete injury of the spinal cord. It was then that articles on various phases of physiotherapy began to be noticeable in print.

On my return to this country early in 1917 I was pleasantly surprised to see the beginning development of that great corps of physiotherapists which did such great work for the boys during the next few years. That was the real beginning.

In 1920, after demobilization had been completed, the physiotherapists commenced in earnest to organize themselves into a constructive, valuable branch of the medical profession. Physiotherapy departments began to branch out in our larger hospitals and clinics were established in our larger cities.

Because the real value of physiotherapy was appreciated by only a comparatively few physicians, development during the first half of the last decade was comparatively slow. However, with the development of the physiotherapist both professionally and in her ability to sell her goods by showing real results, the development in the last few years has been more rapid. No longer does the physician feel that he has to depend on his own meagre knowledge to instruct the therapist as to just what massage to give, the length of time necessary to bake a joint, etc. He now realizes that after he has once fully discussed the problem with his therapist, that is all that is necessary, for her knowledge and skill in her chosen field usually far surpasses his own. It is this development and feeling of sympathy and understanding between the physiotherapist and physician that is now increasing our good results.

Feeling as I do, it is with a genuine pleasure that I welcome you to our city—a pleasure augmented by the knowledge that I am addressing a group of women whose work is valuable and constructive, and I hope that the members of this organization will receive as much pleasure and inspiration from their visit to Milwaukee as we of the city are certain to derive.

Milwaukee, Wis.

Physical Therapy—A Brief Synopsis of the Action of Common Modalities

By T. E. P. Gocher, M.D., Surgical Advisor, Aetna Life Insurance Company

A knowledge of the action of commonly used modalities is necessary to a proper direction of physical therapy. When each modality is used correctly and with intelligence, you will be surprised what good results are obtained. The period and frequency of treatment will be lessened. If penetration is required you must know how to obtain this reaction. If there is a deep congestion of blood that is causing pain, you should know how to lessen the congestion, and not make it worse by bringing more blood to the area.

Diagnosis

In treating industrial injuries by physical therapy, you must know the correct diagnosis and which structures are involved and need to be treated. Unfortunately, only a small percent of diagnoses are correct. This will naturally effect the end-result. If the condition is in a joint, the diagnosis should state whether there is an actual arthritis or a peri-arthritis present, and treatment should be given accordingly. If a joint is injured, the diagnosis should state whether it is a simple sprain, whether a ligament is involved, or whether a fracture is present in the area. If a bone is involved the diagnosis should state whether a contusion or fracture. Also, if the fracture is simple, compound, comminuted or whether delayed union is present. If a nerve is injured then the diagnosis should state whether a neuralgia or a neuritis and the location of this pathology. You must know whether the condition is in a root, trunk or a localized portion of the nerve.

Disability Causes

There are three principal causes of disability. These are pain, loss of motion and weakness. Modern physical therapy will produce remarkable results in the treatment of these symptoms. To attain success one must know what structures are involved and the nature of the trouble. The treatment of each will vary.

The following is a brief outline of my general opinion as to the manner in which some of the different modalities function, and how penetration can be obtained or only a superficial reaction result.

Light

There are two main divisions of light-heat treatment. They are the infra-red and radiant light bake. Radiant light causes a dilatation of the blood vessels and increased secretion of the sweat glands, and is an arterial sedative. It has a local action and has more penetration than the infra-red. On account of the visible waves in this light, it is quite easy to cause a deep burn while giving a treatment. As a general rule, it is found that the further away the light is from the patient, the reaction tends to be more sedative, and some of the rays will penetrate deeper, and the more lasting the effect, the less danger of burning.

The infra-red has a marked local sedative action, but there is much less penetration than with the radiant light. The radiant light is more heat producing than the infra-red. In fact, the entire or most of the action of this light is what would be called a superficial reaction. A superficial hyperaemia is readily obtained and excellent results are obtained in withdrawing blood from deep areas. On account of the marked decrease of the visible light waves, this light is much safer to use and the danger of burn is much less.

I believe that both these lights should be given with a free current of air and no covering from the light to the patient, as a tent. If the light is so covered the heat is increased very quickly and there is a marked danger of burning in the use of the radiant light. The heat obtained should feel "just warm" to the patient and never give a "burning feeling." The products of sweat glands are not carried away by the air currents to any marked degree and a marked superficial hyperaemia results when the part is covered. This hyperaemia impedes the penetration of the light waves to a degree. The cellular action, as the air passed over the part, has a beneficial effect. If a superficial hyperaemia with sweating is desired, then the closed method is probably the best.

Massage

Massage improves the metabolism and maintains nutrition. It breaks up adhesions and hastens repair, but

massage will not alone strengthen a weakened muscle. We use massage in an effort to speed the circulation and improve the blood and lymph circulation and so lessen pain. It relieves fatigue by getting rid of waste materials in the tissues and improving the blood supply. It is sedative and relaxing if given slowly and lightly, and is stimulating if given rapidly and with force. If a weak muscle or tender area is to be treated, then great care must be used that only a light form of massage is given. Effleurage or stroking often accomplishes excellent results by itself.

Too often we find that under the form of treatment given the patient is improving well, but he is also given a massage and when the treatment is finished, the patient is worse off, and in some cases will have to go to bed on account of the disastrous effects of overtreatment. Therefore, when you are giving a massage treatment, be careful that you fully realize where the injury is, and if the part is weakened by disease, treat very slowly, increasing force and time as the condition improves.

High Frequency Currents

There are certain facts that should be remembered while giving electrical high frequency treatments. You will recall that current control can be obtained by the use of the rheostat or choke coil, also by the distance between the points of the spark gap, and by the number of spark gaps in the circuit. Remember that spark gaps influence the voltage chiefly, while the rheostat or choke coil influences the amperage chiefly.

I believe that the greatest penetration can be obtained with the spark gap as wide as possible, or at least two-thirds open, and the rheostat as low as possible. This will tend to give a current of high voltage and low milliamperage. It must be remembered that as you open the spark gap and the amperage rises slowly, the voltage jumps up very fast. The frequency of the current also lessens to a certain extent and therefore the current is less smooth.

In going back to the subject of penetration, I believe that penetration will change with the proportion between the volts and the milliamperage. The higher the ration, the better the chance for deeper penetration. When this method of proportion is being worked out, it must be remembered that we can use only a sufficient current that the patient can stand, and not the greatest current that the machine is able to give. We may have a current in the machine that would give a true diathermy, but if we were to use that full current, we would have very disastrous results upon the patient and therefore can only use a much lesser current.

In certain portions of the body, there are joints and areas which may become injured and must be treated, but are deep in the body and are very difficult to satisfactorily treat. If an electrode is placed above and below such an area, there is great doubt as to whether the electricity will reach or affect the area, on account of the different changes in the resistance that the current would have to pass through. The current would tend to take the path of least resistance, which would result in more of a peri-thermy than a real diathermy. In these conditions it is better to place an electrode at a distance above and the other below the area in such a position, that as the current tends to take the shortest way between the two points, some of the current, at least, will pass through the desired area and a reaction should be obtained. A good illustration of this is in treating a sacroiliac joint when the injury is to the anterior surface. In this form of treatment, I believe that one electrode should be placed just beneath the shoulder blade of the injured side and the other electrode on the anterior surface of the leg on the opposite side, and a current of high voltage and low milliamperage passed through. The milliamperage is usually between 200 and 400.

Another way to obtain penetration is to use first a current of very high voltage and low milliamperage. After this current has been used for a period of time, then it is changed to a current of higher amperage and lower voltage. This increase may be done two or three times with safety. The high voltage current should be kept on at least for five or ten minutes before the change to the other current.

In using high frequency electric currents, it must be remembered that one occurring with a high proportion between the volts and milliamperage tends to affect the nerves much more than one with a low proportion. An Oudin or similar current may make a patient with head injury very nervous, while the Tesla or d'Arsonval current may not have this effect. The Oudin current will often make an acute neuritis much worse. An Oudin or similar current is the best nerve stimulant and has the greater penetrating force. I believe that the other currents act better for circulatory conditions.

I have also found that in treating joint cases, that many times a true diathermy may be given and excellent results obtained. Then, if toward the end of the treatment you give, say for the last ten minutes, a peri-thermy, a much greater and better result is obtained than if the single current is used alone. I have been in the habit of using this form of treatment in many of the joint cases and have obtained much better results than if using diathermy alone.

It should therefore be remembered that if depth is required that a true diathermy should be given; but if the condition that is to be treated is superficial, then the best results are obtained by using a peri-thermy.

Sinusoidal and Faradic Currents

I am not attempting to go into the uses and actions of all the other electric currents as they can be obtained, and their actions well learned from reading a text book. A Faradic current, especially if from the Bristlow coil, is of great value in industrial cases. This is because individual nerves and muscles can be studied with the use of this current and in many times, a traumatic neuralgia can be ascertained, by the pain caused by this stimulation, long before it causes its presence to be recognized by symptoms. A test of muscle action and teaching how to contract muscles, also teaching the patient how to use individual muscles can be greatly assisted by the use of this Bristlow coil. The Bristlow coil can be used to demonstrate malingering in that voluntary contraction develops before the ability to contract the muscles with this coil is obtained.

The sinusoidal current is of special value. The individual varieties of this current have special actions which are of great value in industrial cases. Swelling can be reduced and very often an oedematous limb can be softened with great rapidity and remarkable results, by the use of this current. In giving a mild treatment, one which the contraction can be felt by the operator but not seen, remarkable results are obtained in certain cases and usually in recent injuries best. This current may be given through a limb in a cast. This is especially valuable in cases where pain is present, and a fibrosis is occurring. A mild massage, which this current gives, will often prevent pain or fibrosis from developing, and if not, will greatly reduce the acuteness of the condition. In passing the current through a cast, the current and contraction should be felt by the operator but not seen.

EXERCISES

Exercises and muscle training are of the utmost importance. I believe that individual muscle training is a very great factor in obtaining good results. If a group of muscles can be trained individually, they can then very readily be trained to act as a whole and excellent results are obtained. Exercises cannot cause a single individual muscle to contract alone but can be so given that that muscle will have to do the most of the work required to move the joint or area. In training the fingers to grip and to move in unison, the ability of individual muscle training is an important factor. Too often an area, that has two or three muscles attached to it, is just exercised and that is called a muscle training. If there is a strong muscle present, usually that muscle will get more benefit from exercise than the weakened muscle, and therefore I believe it is best to treat each muscle separately, as much as possible. Great care should be taken not to overtrain the strong muscles, but to train well the weakened muscles. Always remember that a weak muscle requires care and gentle treatment and should not be treated as if the muscle was normal and strong. In starting to train a weak muscle, the position of greatest ease should be used; that is, a position where gravity assists. The injured man can be greatly assisted by demonstrating to him how to move the muscle and then assist him with electrical contraction. The Bristlow coil is excellent for this.

Exercises should first be assistive, that is, the operator should assist in the motion. They should then be passive, active and resistive. Great care should be taken in resistive exercises that only sufficient opposition is given to obtain a good muscle contraction. The working ability of a muscle should be tried out very mildly at first, and then increased as strength returns. Be sure not to overtire the muscle, as it takes an exhausted muscle a long time to return to normal and it is often subject to toxic changes, which may be quite detrimental to the patient.

ULTRA VIOLET RADIATION

Ultra violet radiation will now be discussed. There are two main sources in giving this form of treatment. They are the water cooled ultra violet and the air cooled ultra violet. There is a new form being given called the cold wave ultra violet. This form of treatment will not be touched upon.

Water cooled ultra violet is used chiefly for bactericidal effect and as a counter irritant for skin diseases over a bruised area. By its use a very excellent irritation is produced. A second or third degree erythema is usually all that is needed. The area treated should be small and multiple if necessary, as along a nerve.

In injuries that involve muscles, nerves and bones, very excellent results can be obtained if a long wave ultra violet radiation is given as part of the treatment and especially at the latter part. By a long wave radiation I mean where the light is placed at a distance of approximately 30 inches or more from the part to be treated. In my practice, I usually attempt to get a good first or second degree erythema from the radiation. This radiation has an excellent tonic effect and also tends to cause a minute cellular effect of the area with respect to the muscle tissues. The ultra violet radiation acts on the skin and causes a chemical reaction there. Authorities now believe that this reaction is the formation of vitamine D which is absorbed into the blood and helps to cause this reaction of the light. This vitamine is caused by the action of the long wave ultra violet upon the skin tissue.

If a nerve injury occurs, or there has been a long period of non-use of a muscle, there is nothing better to assist in curing this case than the use of long wave ultra violet radiation. It has a marvelous tonic effect and assists very greatly in building up these tissues. In treating nerve injuries, or a sciatic neuralgia, I have found that long wave radiation is of utmost value over the area of soreness.

This radiation is always though in the form of a long wave radiation and never a short wave. The area to be exposed should extend from the buttock down throughout the course of the sciatic or other nerves of the leg, that are inflamed. During my course of treatment of industrial injuries, I have made it a part of my technique to use ultra violet radiation of long wave technique in many of the cases that are of any magnitude. The value of this form of treatment is questioned, but in my mind and from the results that have been obtained, I am fully convinced it does benefit.

The effect which is obtained from giving this radiation should never be called a "burn" but should always be spoken of as an "erythema" or "reaction." The moment the word "burn" is used, then the average patient will believe that an overtreatment has been given and results that are not looked forward to have been obtained. Therefore, their confidence in you will tend to lessen. It also has a bad legal effect. If you explain that it is just a local reaction, they will usually retain their confidence. It is often good judgment to inform your patient that within an hour or two after the treatment, there is a possibility that he will have a local redness over the area treated. Tell him not to be alarmed at this as it is the reaction to be expected and may last from six to eight hours or possibly longer, and then will usually disappear.

Care should be taken in giving this form of treatment to those who are susceptible to it or susceptible to proteins sensitization. Corn and hot cakes may cause a very marked reaction if taken before a treatment. Patients who have had a chronic malaria and are not fully recovered should also be treated with great care as this radiation might bring back the condition of malaria.

PSYCHOLOGY

This subject is one that all physical therapy technicians and surgeons should study. It is of great value and I believe that many good treatments are not successful due to the fact that the psychology used was poor. I have had patients come to me complaining that no interest was being taken in their case by the surgeon. This does not have a good mental effect on the injured. When you are treating a patient, be sure and treat his mental condition. It will be of assistance to you, and if nothing else, it will cause the patient to retain his confidence in you and your treatment. Always be cheerful, and try to encourage the patient to see the better side of life. Never tell a patient or his family that he has a neurosis, call the condition an emotional state or functional overlay.

CONCLUSION

A good knowledge of the actions of the different modalities of physical therapy must be had before the best results are obtained in treatment. These modalities may be used singularly or in combination. If used intelligently, the results obtained will be surprising and gratifying.

333 Pine St., San Francisco, Calif.

Chronic Arthritis

By Captain H. P. Marvin, Medical Corps, Fitzsimons General Hospital, Denver, Colo.

Approved for publication by order of The Surgeon General, December 29, 1932, Washington, D. C.

A discussion of the subject of arthritis with especial reference to chronic arthritis leads us into one of the most discussed fields of medicine, and one about which there are perhaps more different opinions, especially regarding its classification. Cecil states that "Chronic arthritis is a term used to describe any chronic inflammatory condition of the joints, or of the periarticular structures," which explains why some of us, at least, fall down in the very beginning for we often fail to consider the periarticular structures in our deliberations upon this subject.

In considering diseases of the joints, which constitute the very oldest pathological conditions of which we have any record, we find that arthritis and rheumatic disturbances occurred even during the Stone Age, and we are told that there is evidence to show that many forms of life were thus affected before the existence of man. Not only is it one of the oldest diseases known, but is recognized as probably the greatest cause of human morbidity at the present time. In the city of Berlin there are between three and four times as many pensions paid for disability due to arthritis as for tuberculosis. Likewise, in the State of Massachusetts we find 150,000 persons with arthritic disability contrasting with 75,000 cases of tuberculosis.

Since we should not forget the various structures which are included in the joint, in addition to the ends of the bones, the mention of a few of these may not be entirely out of place at this time. First, the ends of the bones are covered with a vascular cartilage which is usually hyaline, but may be fibrous as in the sterno-clavicular joint. Second, we find laterally where the surfaces of the joints do not touch, there is a coating of perichondrium, a fibro-elastic membrane which may undergo transition into the parts of the joint which are free of cartilage. Third, the joint capsule which contains fibro-elastic tissue and carries blood vessels; fourth, the synovial membrane which is folded into many situations, secretes a mucoid fluid containing about 6 percent solids and is not normally found over the ends of the bones, but may be in pathological conditions. Fifth, it is well to remember that the joint cavities are closely related to other serous sacs with the principal differences that here the synovial membrane is thicker, the blood supply is better although absorption is relatively poor and not to forget also that the differential diagnosis between a bursitis and an arthritis is not always as easily made as we might expect.

It now appears that the infectious nature of most arthritic and rheumatoid conditions which we have considered as well understood in most instances, is not nearly as simple as it seemed to many of us. In a large series of cases studied by Pierce and Pemberton it was found that "heredity played a surprisingly large role," while the studies of Osgood and Goldthwait show that "a certain body habitus underlies much of the disease as a whole" especially the atrophic type. We do not doubt in the least the importance of focal infection in the etiology of arthritis, however, in many cases it acts in a precipitating role or what we might term as the exciting cause rather than as the primary or predisposing factor. Thus, we are told that while many cases are precipitated by influenza, furunculosis, pyorrhea or some other infection, the actual cause or causes may have been present for years. Endocrine disturbances may play a small part in a certain few cases while still other joint changes are found in certain chronic diseases such as Tuberculosis and Syphilis. The most common organism reported in cases of arthritis is the streptococcus viridans, followed in order by the streptococcus hemolyticus, the staphylococcus and colon bacillus.

More and more are we arriving at a point where we try to explain the etiology of certain conditions or diseases upon the basis of allergy and allergic reactions. Doctors Freiberg and Dorst have done considerable work along this line in chronic arthritic cases, and have come to the conclusion that in addition to the tuberculous, gonococcal and other frankly infectious arthritides there is a separate so-called non-specific type which "is designated as allergic" and "has a definite group of clinical findings." They believe that they have demonstrated the relationship between antigenic substances from distant foci and the diseased joint as well as the value of their prescribed treatment which consists of desensitizing patients to autogenous antigens which have given positive reactions.

In Nelson's we find the following main groups of chronic arthritis, in a table which indicates very clearly the differences in opinion as to the classification of this subject. Many others are given by various authors depending upon whether they work upon the clinical, etiological, or pathologico-anatomic basis.

American Committee	*Atrophic*	*Hypertrophic*
Nichols and Richardson	Proliferative	Degenerative
English	Rheumatoid Infectious	Osteo-arthritis
Goldthwait	Atrophic	Hypertrophic
Ely	Type I	Type II

Both Nelson's and Cecil comment very favorably upon the work done by Nichols and Richardson, who classify the chronic arthritides into Proliferative and Degenerative; the proliferative type which has a tendency to destroy the joint cartilage and lead to bony ankylosis of the adjacent joint surfaces, while the degenerative, which likewise destroys the cartilage, produces bony overgrowth and deformity without ankylosis. We formerly considered a third type which was termed as metabolic arthritis, gouty arthritis, or chronic gout, now considered as a separate and much less frequent disease entity, the differential diagnosis of which is seldom difficult. One author considers that arthritis is a symptom, and that the various types seen are nearly all referable to a few fundamental disturbances of physiology and that the whole subject should be referred to a simple and possibly even to a single basis.

The pathological changes found in the various arthritides are many and varied, involving any or all of the parts which make up the joint and its surrounding structures. In addition, the nearby muscles, tendons, nerve

sheaths and even the fatty tissues may become involved. In Kauffman's Pathology we find a very fine detailed description of the different changes which may take place in the various joint structures such as degeneration with deposition of calcium salts in the cartilages, transformation of cartilage into bone and connective tissue, as well as hypertrophic changes which often form nodules, some of which are found free in the joint cavity.

Atrophic or Proliferative arthritis is usually characterized by swelling of the soft tissues, especially in the smaller joints, often with subluxation or ankylosis later in its course. Early there is an overgrowth of the synovial membrane over the various joint structures, producing a granulation tissue and generalized destruction, accompanied by a proliferation which may occur simultaneously, resulting in a mergence of the two marrow cavities with bony ankylosis. On the other hand, the deformity in the hypertrophic or degenerative type is usually more irregular with less changes in the soft tissues and true ankylosis never developing. "The first change is a fibrillary degeneration which erodes and softens the hyaline cartilage, exposing the underlying bone." The lesions are seldom symmetrical and usually there is a "compensatory proliferation" of the cartilage or bone of the opposite joint surface, resulting in irregular contact which is rendered smooth by friction between the opposing surfaces.

The diagnosis of arthritis in the majority of cases is not especially difficult as there is often a history of some infection plus the localized symptoms, physical and X-ray findings. It is much more difficult to determine the specific type of involvement in the light of present day conception of the subject and often it takes a period of observation before it can be decided into which type the case is to progress. Occasionally, however, it may be impossible for the average clinician to classify certain cases due to the vague history and absence of clinical or X-ray findings pointing to either type. It is well to remember that the first type in the above table occurs usually between 20 and 50 years of age, in a patient who is undernourished, anemic and chronically ill, showing muscular atrophy which is marked in the late stages, often with various cutaneous changes and a sedimentation rate of red blood cells varying between 30 and 120 m.m. in nearly all active cases. On the other hand, the second type occurs after 40 years of age, in women usually at the menopause, the patient being well nourished, not anemic, without muscular atrophy or cutaneous changes as a rule and a normal or slightly increased sedimentation rate. This last mentioned procedure is one which is said to be recognized as of considerable value in European Clinics and is a routine procedure in the Arthritic Clinic of the Presbyterian Hospital in New York.

Although most cases show X-ray changes at the time they are hospitalized, it is very important not to lose sight of the fact that many an injustice has been done by failing to diagnose and treat an arthritic condition because of the lack of X-ray evidence in the joint or joints of which the patient complains. This, of course, works the opposite way as often, especially in the large number of patients which we get daily that are seeking a basis for compensation. However, in all fairness, it becomes necessary to give each case careful consideration that we may not occasionally make a mistake and fail to start treatment at an early time when much benefit would be obtained. Certain cases follow an acute type of the disease while still others which are chronic from the beginning may get a so-called "flare-up" and the development of an acute rheumatic fever, with its accompanying cardiac involvement.

The general symptoms which may be found in the chronic cases are headache, general body pains, some anemia with loss of weight, accompanied at times by slight fever and loss of appetite. The local symptoms and signs may consist of pain, tenderness, swelling, heat, slight redness and limitation of motion, with which we are all familiar. The X-ray, as already mentioned, is usually of especial benefit in giving us some information regarding the changes which are taking place in the joints, more helpful possibly to the clinician in arthritis of the sacro iliacs and spine than in the extremities. And, in this connection, may we not overlook the fact that routine X-rays often show up an old arthritic process which has never caused the patient any discomfort and doubtless never will but, if mentioned to him, may start him on the road to chronic invalidism and require indefinite periods of hospitalization.

Contrary to the belief of some, at least, the prognosis in chronic arthritis is fairly good in the light of present day knowledge regarding treatment. The largest percentage of cases can be promised more or less relief depending upon the type, its stage of development, and the patient's willingness to cooperate fully for as long a period as is necessary. Not only do we get symptomatic relief and improvement in over 75 percent of cases, but a reasonable number reach what we may consider to be a clinical cure at the time they leave the hospital, a few of which may relapse or have acute exacerbations at varying intervals after discharge. Moreover, the severity of the arthritic condition upon admission cannot be taken as a criterion upon which to base a favorable or unfavorable prognosis, for it happens that an arthritic patient, bedfast upon admission, may return to his work or profession in due course of time, whereas a mild condition when first seen may eventually progress into a severe case of arthritis deformans despite any and all kinds of treatment.

Without going into details, it is desired to give the more common ways by which we may treat cases of chronic arthritis. First, and of much importance, is the removal of the focus or foci of infection, providing the condition is not entirely of traumatic origin or due to some chronic disease, in which case we may consider the disease as the so-called focus. This is not always easy, and frequently we find two or more sources of infection in which case each one should be given careful consideration and treatment. General care of the patient, which includes rest as necessary, good nursing, care in preventing bed sores in bedfast cases, and attention to good elimination, all are important.

The salicylates are beneficial early, especially in the acute stages, but if sodium salicylate be administered over too long a period the general health as well as the function of the gastro-intestinal tract is usually interfered with. Aspirin is beneficial for relief of pain thruout the course of the disease. Guiacol carbonate in 15 to 30 grain doses, or arsenic in doses of 2-3 minims of Fowler's solution may be beneficial. Iodides have proven very helpful given as the sodium or potassium salt, or as the syrup Ferrous Iodide in 15 to 60 minim doses three times a day.

Locally it becomes necessary at times to use fixation by sand bags, splints or elevation and rest on a pillow, as well as the use of a belt in certain cases of involvement of the lower spine and sacro-iliac joints. Heat or cold in the dry or wet form may be indicated as well as various ointments or liniments such as methyl salicylate, chloroform liniment or guiacol in olive oil.

The diet is often a problem, especially in those cases

in which it is necessary to extract all remaining teeth. The digestive ability and nutritional needs of each patient should be considered, as well as special diets, the value of which is questioned by many, but may be of benefit in certain cases. Fletcher and others have found a group of cases in which X-ray studies have shown an elongation, widening and inertia of the colon, which was materially benefited by a diet low in carbohydrate with a high vitamin content and a moderate increase in protein.

The operation of sympathectomy, following which Adson and Rowntree report a marked improvement in blood supply to the involved parts with marked benefit both subjectively and objectively, is a procedure which has its advocates. There is little doubt but that autogenous vaccines alone, or in combination with various stock vaccines, have produced striking improvement in some cases. Likewise, non-specific therapy, given in various ways but most often perhaps as O.1 to O.2 c.c. typhoid vaccine intravenously, is reported as of value.

However, we turn to the Physio-Therapy Service for our greatest aid in the treatment of chronic arthritic cases. Heat is applied to the involved parts by means of baking, diathermy and cabinet baths, which in turn increase the blood supply thus promoting elimination by way of the skin and the general circulation. Massage not only increases the circulation of the parts but helps to keep up their function and prevent muscle atrophy. Exercises which include active and passive motion and gymnasium work of various types, are most beneficial in helping maintain and improve muscle tone and function, in addition to that of the joints. These plus artificial heliotheraphy are probably the most frequent methods of physiotherapy used in the treatment of arthritis. Too often it happens that the attending physician receives credit for the remarkable improvement so often obtained in severe cases when actually, from 75 to 90 percent of the benefit was due to the tireless efforts of those who daily carried out the prescribed physiotherapy treatments. On the other hand, much harm can and has been done by selection of the improper type of physiotherapy, and we have to remember that certain complications may arise at any time during the treatment of a case which may require immediate discontinuance or change of the procedure being used.

In conclusion, it seems very pertinent to quote extracts from a recent article by Dr. Ralph Pemberton of Philadelphia in "The Journal of Laboratory and Clinical Medicine" as follows: "The problem of arthritis has recently entered upon a new phase of development. Stagnant and neglected for many years, interest in it has been revived and has become active. Clinics for the study and treatment of the disease have arisen within the last three or four years in all parts of the country. It may be well to enumerate briefly the chief developments which have taken place in regard to the problem of arthritis both internally and externally. They are as follows: Recognition of the economic importance of arthritis, with consequent pressure from the industrial world that more be done about it; establishment of the American Committee for the Control of Rheumatism for cooperation in an almost worldwide investigation of the question; general recognition of two main morphologic types of the disease; recognition of hereditary and constitutional influences, together with the existence of prodromata which often allows the disease to be anticipated; evaluation of the problem of focal infection, to which extreme values have often been attached; recognition of the rationale back of certain useful forms of therapy; and, finally, a greatly widened outlook in general with justifiable optimism for betterment or even a cure of at least three-fourths of all patients under properly controlled and dispassionate conditions of therapy."

Fractures

By Ruth E. Dunn, R. N.

There is so little written on the treatment of fractures as far as physio-therapy is concerned that the student physio-therapist in hunting for reference reading finds herself confronted with huge volumes intended for orthopedic surgeons. She must wade through much superfluous and difficult reading to get what there is to find in so far as her work is concerned. This paper on fractures is written in the hope that it might aid the student physio-therapist to understand and appreciate the treatment of fractures.

General Considerations

"A fracture is a sudden separation of osseous fibres due to injury; in a general way it refers to the breaking of a bone or cartilage."

The etiology of fractures comes under two headings, (1) predisposing causes and (2) determining or exciting causes. Some predisposing causes are position (exposed or unexposed), shape, proportion of osseous tissue and age. Bones are elastic and yielding in infancy and adolescence, becoming harder with age until in old age the bones are very brittle. The presence of epiphyseal cartilage in early age is a predisposing factor of diastasis or epiphyseal rupture.

The exciting causes of fracture are (1) external violence and (2) muscular action. Fractures may be caused by direct or indirect violence. A fracture due to direct violence occurs under the point of the fracturing force, e. g., fractured oscalsis by fall upon feet. A fracture due to indirect violence occurs at a point distant from the point of the fracturing force, e. g., fractured clavicle due to fall upon the hand.

Under fracture by musclar action we find (1) fractures due to sudden contraction of muscles alone, e. g., fractured patella or olecranon (2) fractures caused by contraction of muscles with part of the bone fixed so that a lever action is produced, e. g., spiral or oblique fracture of humerus from wringing out clothes, (3) fractures due to sudden muscular action of a part in motion to produce sudden arrest of action, e. g., fractures produced by throwing or lifting. Sometimes we find rib fractures from violent coughing. Sprain-fractures are a common form of fracture due to muscular action.

Pathologic Fractures

These fractures occur following a minor injury, muscular action alone or without any demonstrable causes at all. They are found in bones of brittleness or lack of

resistance due to a local lesion or general disease. Some local bone diseases causing fractures are infectious and tuberculous osteo-myelitis, new bone growths, malignant or benign, and aneurisms. General diseases which are factors in pathologic fractures are syphilis, rickets, osteomalacia, scurvy, osteogenesis imperfecta, osteopsathyrosis, etc.

FRACTURES IN UTERO

There are spontaneous and pathologic intra-uterine fractures. Spontaneous fractures are caused by external violence and are very uncommon. Pathologic fractures are generally due to syphilis, rickets, osteochondrosis or amniotic adhesions. It is difficult to differentiate between intra-uterine and intra-partum fractures. The latter occur during delivery due to faulty management. The most common lesion is epiphyseal separation although fractures of the shaft of the bone do occur.

VARIETIES OF FRACTURES

A closed or so-called simple fracture has no communication between the site of fracture and the outside.

An open or compound fracture is open to the atmosphere through a wound of muscle, fascia and skin.

Classified according to degree we have incomplete and complete fractures.

Incomplete fractures:

1. Fissures—linear break with slight separation of fragments; most common at base of skull.
2. Infraction—"green stick" or true incomplete. Bending or angulation of part of a bone. Occurs in children only.
3. Depressions or indentations—depression of cortex of bone without complete fracture; result of direct external violence. Skull is most common site.
4. Separation of an hypophysis or sprain-fracture—tearing off of small scale of bone to which muscle, tendon, or ligament is attached close to a joint. Result of violent and sudden muscular action. Often found in baseball or tennis players and called "tennis-elbow."

Complete fractures:

The line of fracture in a complete fracture involves the entire thickness of bone, separating it into two or more fragments.

In relation to direction and character of line of fracture we find,

1. Longitudinal fractures—line of fracture not further than 15 to 20 degrees from long axis of bone—Rare.
2. Transverse fractures—plane of fracture makes nearly a right angle with long axis of bone.
3. Oblique fractures—single or double line of fracture, making an angle with long axis of bone—commonly found in shaft of tibia, humerus, and femur. May be multiple.
4. Spiral fracture—prolonged oblique fracture encircling entire circumference of bone. Produced by torsion or twisting when one part of extremity is fixed.
5. Subperiosteal fracture—no separation of fragments and periosteum is not lacerated.
6. V, T, or Y-shaped fractures—named from line of fracture resembling these letters.
7. Compression fracture—driving together of cortical and spongy layers of bone as result of condensing force. Commonly found in os calsis, astragulus or vertebrae due to a fall from a height.
8. Comminuted fracture—two fragments as well as splintered bone at seat of fracture; due to sustained great force or brittle bones due to senile changes.
9. Impacted fracture—result of violent driving together of two fragments; fibers entangled and immobility with fixation results. Found at neck of femur, lower end of radius, and cervical neck of humerus.

Fractures are spoken of in relation to position as being in the upper end, lower end, or shaft of the bone, or in relation to bony prominences such as supracondylar or condylar fractures.

Articular fractures are those involving a joint.

1. Intra-articular fractures—line of fracture entirely within joint.
2. Para-articular fractures—near joint so that healing interferes with joint function.
3. True articular fracture—line of fracture involves intra and extra articular bone.

These three forms may vary from a single fissure with no laceration of capsule to extensive comminuted fracture with extensive lacerations of capsule.

Epiphyseal separation is a partial or complete separation of epiphysis from the diaphysis before ossification of the epiphyseal cartilage takes place. There is a possibility of arrest of growth in the bone thus affected due to faulty replacement of the epiphysis or to premature ossification.

In relation to number of fragments, we have multiple and double fractures. A fracture of two or more bones or more than two non-communicating lines of fracture in one bone is known as multiple fracture. Two unconnected lines of fracture in the same bone is termed double fracture.

DISPLACEMENT

The fracturing force or the muscular contraction after a fracture often gives a displacement of the fragments. The displacements are called angular, rotary, transverse, longitudinal, or crushing according to the direction and manner in which the fragments are displaced. The distal fragment usually occupies the abnormal position. The fragment nearest the body is called the proximal fragment while that farthest from the body is called the distal fragment.

SYMPTOMS

The local symptoms of fracture are deformity (not always present), abnormal motion of the part, crepitus, swelling, pain, tenderness, ecchymosis, loss of function and intermittent muscular spasm. The symptoms vary of course, with the type and severity of the fracture.

Shock nearly always accompanies fractures, being more severe in compound fractures and fractures in aged persons.

REPAIR OF FRACTURES

Fractures always heal unless there is a mechanical bar to tissue growth. Healing is performed by the growth of granulation tissue which is derived from the wounded soft parts of bone—periosteum and endosteum—and the areolar tissue about the vessels in the narrow cavity and elsewhere. The source of calcium for the calcification of this granular tissue is the dead and autolyzed bone at the site of the fracture and not the blood. Bone is able to form without the presence of any bone cell. This new bone is called callus. After the callus has been formed a large mass may be felt over the site of the fracture or the patient will ask about the "bump" on his arm. This mass is the excess callus and is later absorbed.

Bone and soft part circulation are of prime importance in the process of calcification of fracture healing and should be prime objects of attention early in the bone healing process. The use of heat, massage, elevation, and active motion are more important then than later.

COMPLICATIONS OF FRACTURES

Sometimes fractures are accompanied by one or more of the following complications:

1. Lesions to the overlying soft parts and as blebs and lacerations.
2. Injury to important blood vessels often with thrombosis and embolism.
3. Injury to important nerves. Sometimes nerves not injured by the fracture itself will become pinched off or enclosed by the callus formation later. Paralysis results from nerve injury, the amount and duration depending upon the severity and extent of nerve injury.
4. An adjacent dislocation may be associated with a fracture. Dislocation of the head of the radius with a fractured ulna is quite common.
5. Injury to muscular system. Atrophy, adhesions and loss of function result from long immobilization, especially in older people.

A secondary complication of fracture is ischemic paralysis or Volkmann's Contracture. This is a rapid degeneration of muscle fibers with associated changes in the nerves due to a cast, splint, or bandage that constricts blood circulation. Always instruct the patient or his parents to watch toes or fingers for signs of swelling, cyanosis or numb feeling and to get to the doctor immediately if these symptoms occur. Volkmann's Contracture presents a picture of marked atrophy, shortening of muscles, contracture, loss of sensation at times, and loss of muscular power. In the hand we find a typical picture of marked flexion at the wrist and phalangeal joints. Prevention is of great importance here, as there is slight chance of recovering normal action once paralysis has been obtained.

Another secondary complication is delayed union. When a bone fails to unite after the usual time has elapsed we have what is termed delayed-union. This may be due to faulty calcium metabolism, general poor health, or local bone diseases. Fresh air, heliotherapy and regulated diet for general building up; diathermy as well as radiant heat and massage locally; phosphorus or calcium salts by mouth are often ordered for this condition.

Joint stiffness may result from long cast periods or in individuals with an arthritic tendency. Stretching will be necessary in these cases.

TREATMENT OF FRACTURES

The ideal objective in the treatment of all fractures is an anatomical and functional cure—to restore the fragments to a normal position with the best functional result obtainable. The reduction and the retention of the reduction are the work of the orthopedic surgeon but the physio-therapist should become familiar with the types of apparatus and splints which the doctors use. Doctors vary in their treatment of fractures so the physiotherapist should familiarize herself with the methods of the doctors with whom she works.

Following are rules to observe in applying splints or dressings:

1. Do not apply dressings too tightly or that do not allow for swelling.
2. Wooden and metal splints should always be padded.
3. Watch for deformity when changing splints or dressings.
4. In dressing fractures of the extremities leave toes or fingers exposed so that signs of constriction will be noticed at once.
5. Gentle massage may be given before applying retentive apparatus.
6. Replace splints exactly as they were applied by the doctor.
7. Be sure the limb is in the position the doctor wants.

Splints are made from light weight wood such as basswood or yucca; metal in various shapes and sizes or moulded with plaster bandage to fit the contour of the injured part.

The Jones collar and cuff is used to keep the arm in flexion. Two pieces of felt are cut to fit around wrist and to protect back of neck. Slits are cut in the felt to run bandage through and the bandage length is regulated by the amount of flexion you wish to keep the arm in.

The cock-up splint, made of plaster to fit the anterior contour of the forearm, is commonly used for Colles fracture.

The clavicular cross or T-splint is used for fractures of the clavicle.

There are many forms of splints for different fractures and the physio-therapist must make herself familiar with the type in use where she works.

The physio-therapist may be called upon to aid the doctor in applying plaster casts. She should become familiar with the ways of applying stockinette, moistening plaster bandage, etc., so that the cast will be applied quickly and efficiently. Always be observant and anticipate the doctor's wants.

THE PHYSIO-THERAPY OF FRACTURES

Heat, massage, and active motion are the three main principles in the physio-therapy of fractures.

1. Heat is soothing, reduces swelling and aids in the absorption of extravasated blood. The increased circulation aids in the healing process also. The fractured part should be exposed to radiant heat for at least 20 minutes or until the skin is red and moist.
2. Then massage is given; always a light effleurage. There is danger of stimulating an excessive formation of callus causing myocitis ossificans if heavier massage is given, especially in fractures around the elbow. If massage is ordered by the doctor a few days after the fracture, do not massage over the site of the fracture. The massage should be very soothing, gentle, and rythmical. Powder is best to use for fracture massage although coconut oil is best after removing a cast, to remove the dried and scaly skin. The general rules of massage should be observed in the treatment of fractures.
3. Active motion of the adjacent joints is started as soon as possible to stimulate circulation and prevent adhesions or muscle atrophy. When union is firm, more strenuous motion can be given. Active motion is much more effective and results obtained more quickly than with so-called passive motion or stretching in treating recent fractures. Long passive stretching such as hanging is more effective than short passive stretching on the part of the physio-therapist. Stretching has its place with old fracture cases or with joint stiffness resulting from long cast periods or arthritic conditions.

In order to know the goal toward which you are working, the physio-therapist should be familiar with the surface anatomy of normal joints and the normal range of motion of joints.

There are variations of the "normal" always, so when possible, compare the injured limb or side of body with the opposite uninjured part. As measured by the goniometer we get 115 to 145 degrees flexion in the elbow with just the reverse for extension. Supination and pronation are at least 90 degrees in the average person. At the wrist there is 60 to 90 degrees flexion, 45 degrees extension, 45 degrees adduction (hand in supination), and 40 degrees abduction. The thumb has adduction of 45 degrees and abduction of 80 degrees or more. The fingers have flexion of 90 degrees while the toes have a little less. Abduction and adduction of the fingers is 45 degrees. The knee can flex 135 degrees from a straight

line. This may be limited by the size and amount of muscle or fatty tissue on the back of the thigh. When the knee is flexed at a right angle it may be rotated 30 degrees or more each way. In the hip we get 145 degrees flexion from extension or a little over 90 degrees from a vertical position. While the body is erect there is 45 degrees abduction. Internal rotation of 45 degrees and external rotation of 50 degrees is possible. In the ankle there is dorsiflexion 30 degrees, and 45 plantar-flexion or from 135 degrees to 60 degrees. Adduction of the front of the foot is usually 45 degrees, abduction 50 degrees. Eversion is possible to 50 degrees and inversion to 45 degrees.

Make use of the roenthenograms of your fracture cases so that you know what you are dealing with and can give massage and motion intelligently.

In giving active motion have your patient do the easiest motions first, gradually working up to the more difficult movements. Assistance may be given but never to the point of pain.

The physio-therapist can always make use of the knowledge of psychology. Remember you are treating a fellow man and not just a fracture.

Electrical stimulation as well as passive motion is used to exercise a part paralyzed from nerve injury along with the fracture. The Bristow Coil or Morse Wave generator are used for electrical exercising. Contractures or other deformities must be guarded against.

SOME COMMON FRACTURES

Pott's Fracture is a fracture of the lower end of the fibula. If massage is ordered from the beginning of the treatment,

1. Always watch the position of the foot.
2. See that the ankle is in a position of a right angle.
3. Always be sure that the foot has not dropped back.
4. See that the sole of the foot and the heel are flat on the foot piece.

If physio-therapy is not ordered until cast is bivalved or splints changed, the splints may be removed for treatment. Begin with toe exercises first. Then splints are replaced after heating, massaging, and exercising.

FRACTURED TIBIA

Oblique fractures will be put in traction and hence no access for early massage. Transverse fractures are usually put up in box splints. If early massage is ordered be sure that splint is replaced correctly. It is important to watch out for and prevent angulation in these fractures as the leg is needed for weight bearing and we must prevent such crippling deformities as genu recurvatum or genu valgum.

To judge whether a fractured tibia is properly aligned, stand at the foot of the patient and looking up the whole length of the leg see that the following bony points are in a dead straight line: (1) inner surface of the metatarsophalangeal joint, (2) inner border of patella, (3) tip of the anterior superior spine of the ilium. Then sit beside the leg with your eyes on a level with the bone to see if there is any angulation forward or back.

FRACTURED PATELLA

These fractures are usually operated upon and the fragments held together with wire. Quadriceps setting as well as a gentle moving from side to side should be given early, before active motion, to prevent adhesion of the patella. Exercises for knee flexion are given and long passive stretching given by placing sand bags on the foot.

COLLES FRACTURE

This is a fracture of the lower third of the radius usually due to a fall on an outstretched hand. The bone is impacted but in a bad position. The wrist is put into a position of wrist flexion and ulnar deviation with plaster or splints. Be sure the wrist is bandaged down firmly on the splint.

Some doctors order baking and massage in the splint on the second week. Then active movements of fingers and thumb are started a few days later. Have the patient make a fist, but not strongly; approximate thumb to each finger tip and start active supination. Encourage your patient to use his fingers and thumb when the splint is worn. During the third week massage and exercises are made a little heavier. The splint is usually discarded at the end of the fourth week. Such exercises as grasping a ball or rolling a piece of newspaper up into the hand until it is hidden by the fingers are good for strengthening the finger flexors and wrist extensors. The physiotherapist can use her ingenuity in devising exercises to be done at home by the patient in case of obstinate contracture.

With Colles fracture there may be injury to the shoulder joint as well, due to the original blow or limitation of shoulder movements if the arm is carried in a sling for several weeks.

FRACTURES OF THE FOREARM

One complication of fractured radius and ulna is cross union. To help prevent this see that the splint is wider than the forearm so that the bandage does not give lateral pressure. In this way pressure is exerted in one axis only from front to back, thus tending to separate the ulna and radius.

Dislocation at the elbow often accompanies a fractured ulna and it is well to remember this when giving active motion.

FRACTURES IN CHILDREN

Epiphyseal separations are treated exactly like fractures. Fractures in children heal more rapidly than in adults and physio-therapy is seldom ordered until fairly firm union has taken place. Some doctors even believe that massage is contra-indicated especially in fractures around the elbow as it might produce myocitis ossificans.

It is in treating children that your knowledge of psychology is of great importance. The first physio-therapy treatment is important. The child has just had the cast or splint removed and he has great fear of being hurt again. Remove his fear of being hurt and gain his confidence by handling the injured part with gentleness and deftness. Passive motion has no place in treating children with fractures, that is, forceful passive motion. Gentle assistance may be given to a movement. Fear and resistance on the part of the patient will defeat your very purpose in giving stretching. Get your patient to do active motion and give him confidence in himself. After the patient has had the soothing effects of heat and gentle massage, finds he can move his arm himself and that you are not going to hurt him, he will work much harder for the rest of his treatments and better end results will be obtained sooner.

There are different types of children and we must treat them individually. Some children become nauseated or faint during a treatment. Shorter treatments are given and active motion increased more slowly in such cases. Some children must be watched that they do not perform a motion too vigorously while others must be encouraged to work harder.

When the union is established and we want to regain arm extension the child is shown how to hang from a bar for long passive stretching. Holding or carrying a

weight only increases arm flexion unless it is done long enough to tire the arm flexors and the weight allowed to stretch them.

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Rhythm and Educational Dancing in the Treatment of the Posture Case

By Catherine A. Worthingham

Rhythm is perhaps of more importance in its relation to physiotherapy than is apparent at a first glance. The rhythmic mechanism of nerve and organ in the involuntary peristaltic action of the intestines and the contraction of the heart muscle are examples of this importance. The voluntary muscle nerve coordination, expressed in the normal performance of the ordinary forms of locomotion such as walking and running are rhythmic. In fact, it is the rhythm that distinguishes the normal performance from the abnormal, the awkward from the graceful. In the field of sport it is the rhythm that singles out the skilled individual from the unskilled. The element of action and rest, in a measurable, repeated form is an essential of all coordinated effort. In fact the necessity of rhythm is apparent when we attempt to do unrhythmic movements. There is a constant tendency to lapse into rhythmic action, even if we consciously make a great effort to maintain the irregular groupings. The effort to use irregular groupings is very fatiguing. It is apparent from these observations that in the treatment of the posture case the conscious use of rhythmic activities can be of great assistance in the development of that kinesthetic sense which is so essential to the effective functioning of the body.

A posture case, severe enough to come to the attention of the doctor and through him the physiotherapist, presents other problems as well as those of body alignment. The patient comes with the definite objective of correcting some physical defect. He is also frequently in need of psychological and social adjustment. It is a recognized fact in modern education that a student learns more than one thing at a time. The subject he is studying may be mathematics, but at the same time, some attitude favorable or unfavorable attaches itself to the effort. If he hates the subject, the value he obtains is questionable. This theory of concomitant learning needs to be considered very carefully, in the handling of the posture case.

Formal exercises are not in themselves mentally or socially stimulating. There is nothing stimulating to the individual who does a set of exercises day after day, even if he has a fair idea of what is hoped for in the way of physical correction. The carry over of such work is questionable. Even after some months of very carefully supervised exercise work in which progress has been made, it is the exceptional patient who, after he has been dismissed from supervised posture work carries on any of it. It is the feeling of the writer that a method of treatment which would tend to stimulate a recreational interest and at the same time have positive corrective value, would be more constructive and yield more lasting results.

To get the most from any activity an individual may engage in, he must be stimulated to use his energy, initiative and originality. He will not use them unless he is interested. He is better satisfied to accomplish his purpose by some method which gives him mental and physical pleasure, rather than a routine which is not interesting in itself, but may possibly accomplish his purpose eventually. His interest must be caught and held. An environment of materials and resources, which will stimulate him physically, intellectually and socially will tend to do this. By means of rhythmical activities and educational dancing a patient may be taught to express many things by means of his body. To do this, he needs to have excellent control over it. Instead of working for control for the purpose of control, he is working to make his body a more perfect tool for the expression of his ideas.

The material presented in this paper is intended to provide a basis for rhythmical activities for posture cases. There has been no attempt on the part of the writer to set hard and fast rules, for the purpose of this work would be defeated if this were done. This purpose is the fullest possible development of the individual. The same problems of development which confront the physiotherapist in the present type of posture correction will confront her in the use of this material. The physical condition of the individual will limit the means of development at her disposal and is the necessary guide regulating the amount of work to be given.

The material on rhythm and educational dancing presented in this paper is a compilation of available material on dancing and corrective exercise. Also the material worked out by the author and her students in eight years of experimentation with the subject is presented. Great care has been taken to analyze each type of activity from the standpoint of the kind of body movement, the possibilities for corrective purposes, and the cautions necessary in certain cases.

In order to develop the body as a means for the expression of the student's ideas in dance form, a high degree of localized control and coordination must be developed. The student's body must be made sensitive and responsive to the demands made upon it. He must have accurate knowledge of the possibilities of movement in the joint and muscle mechanism. Anatomy, kinesiology, and physiology provide necessary correlation here. The physiotherapist must have a knowledge of these subjects if she is to present scientifically correct material to her students. Anatomical charts which show the joint and muscle mechanism of the body are valuable aids to instruction at this point.

In order to avoid incorrect body positions and the pull of gravity, the beginning work in localization is done in the lying down position. As control is developed, sitting, kneeling and standing positions are added. Many posture cases have very weak musculature as well as faulty segmental control. Progress at first is slow if much is to be accomplished. Muscle strength and coordination must be built up simultaneously. It is true in Educational dancing as in the study of any subject, that the foundation must be laid carefully if the best results are to be realized. The mastery of the fundamentals of body movement is not dancing, but is a preparation for it.

Interest may be maintained in fundamentals by emphasizing the acquisition of skill in control as well as by giving the student a sense of direction for his work. If the student realizes that each effort is making progress toward his goal, interest is not a problem. Each accomplished control is a tool of expression.

In the treatment of posture cases, the postural difficulties divide themselves into head, shoulder-girdle, chest, and spinal deviations, abdominal relaxation, and foot and leg deviations. Corrective exercises for the improvement of posture necessarily group themselves into such a classification. Consequently, in the presentation of the technique of Educational dancing for the posture case, a like classification is presented by the writer. Needless to say, the same cautions concerning duration and force of exercise must be used in Educational dancing as would be used in the customary exercise program.

A. *Trunk.*

1. Development of head, upper back and chest control.
2. Development of lower back and abdominal control.
3. Development of entire back, involving lateral flexion and rotation in addition to flexion and extension.

B. *Shoulder Girdle and Upper Limbs.*

1. Control of the movements of the shoulder girdle.
2. Control of the movements of the entire arm by means of shoulder girdle and back control.
3. Control of the arm and hand.

C. *Pelvic Girdle and Lower Limbs.*

1. Control of the position of the pelvis, involving abdominal muscles.
2. Control of the lower limbs from the hip sockets.
3. Control of the leg and foot.

At the time when the fundamentals of body movement are presented, is the time to present an analysis of the possibilities of movement in the parts studied. An understanding of the bony structure, joint mechanism and musculature makes it possible for the student to more clearly understand his own difficulties and the ways in which to correct them. The study may be made even more interesting and instructive by the study of anatomical charts, followed immediately by experimentation with the part studied.

A. *Development of the Trunk.* In the presentation of technique for the development of the trunk, the writer is offering work devised for symmetrical development. Many of the exercises mentioned may be used in the treatment of lateral scoliosis by placing the emphasis on the part needed. In all work involving the abdominal muscles, care must be taken to regulate breathing in such a way that the greatest effort comes with the expiration of the breath and not the inspiration. In this way the intra-abdominal pressure and the danger of hernia may be reduced.[1]

The following fundamentals are planned to be done with a musical accompaniment, which may regulate the response from the standpoint of speed, force and smooth control. Suggested music for the fundamentals is given in another section.

1. *Development of Head, Upper Back and Chest Control.*

(1) Prone lying position. Raise the head upward and turn it from right to left. Relax slowly.

(2) Prone lying position, arms stretched overhead. Raise head and arms, stretching forward and up.

(3) Hook lying position, arms stretched above head, and hands clasped. Roll trunk right and left, starting with a head lead.

(4) Cross leg sitting position, head relaxed forward. Head circling, allowing as free motion as possible.

(5) Partners—one and two. One—Backward lying position, holding arms of two just below the elbows. Two—Stride standing position, holding arms of one, just above the elbows. One raises trunk and head from the floor, chest leading and twists to left as far as possible without allowing hips to lift from the floor. Same to right side. Partners change places.

(6) Sitting on the floor, tailor fashion. Spine relaxed, head dropped forward. Gradually raise chest higher and higher, at the same time bringing head up and back as far as possible. Relax and repeat.

(7) Sitting back on the heels, head resting on the floor. Without placing any weight upon the arms, flex and extend the cervical and thoracic spine as completely as possible.

(8) Half kneeling position. Flex and extend the spine with particular emphasis on the cervical and thoracic regions.

(9) Sitting back on the heels. It is more difficult to move the lower back because it is somewhat fixed by its position. Take as complete flexion and extension of the entire spine as the position will permit.

(10) Sitting on a chair. Flex and extend the cervical spine with the thoracic and lumbar spine held inactive against the back of the chair.

(11) Sitting on a chair. Flex and extend the thoracic spine with the lumbar and cervical spine inactive. Because of its position, it is not possible to isolate the thoracic spine entirely.[2]

(12) Sitting on a chair. Flex and extend the cervical and thoracic spine with the lumbar spine held against the chair.

(13) Backward lying position, with weight resting on the elbows. Press as much of the lower back as possible to the floor. From this position, flex and extend the thoracic and cervical spine.

(14) Standing, maintaining correct pelvic tilt. Flex and extend the cervical and thoracic spine.

(15) Side lying position, feet against wall, arms extended over head, head resting on lower arms. Use head lead and flex the spine as far as possible. Using lumbar spine for the starting point, extend the spine to the straight position. From the straight position secure as much extension as possible in the thoracic and cervical spine, taking great care to maintain the correct pelvic control. (In case of flat back, the individual might be encouraged to secure extension in the lumbar region as well.)

(16) Side lying position, knees flexed slightly for balance. Top arm placed on the floor to steady the body. Flex knees to chest strongly and at the same time push head back until a straight position is reached. Maintain pelvic control and extend thoracic and cervical region as far as possible.

(17) Crawl position. From flexed position of the

[1] Lowman, Colestock, and Cooper, *Corrective Physical Education for Groups*, A. S. Barnes and Co., 1928, 108.

[2] H'Doubler, Margaret, *The Dance and Its Place in Education*, Harcourt, Brace and Co., 1925, New York, 67.

body, sitting back on heels, head relaxed and resting on floor, arms resting on floor in front of head—slide right foot back until leg is straight.

(a) Take extension of spine, starting the movement in the cervical spine by lifting the face first. Carry extension through the cervical and thoracic regions, then relax forward slowly.

(b) Take extension of spine, starting the movement in the thoracic spine. Relax slowly. Change the legs and repeat. Repeat all with the hands clasped behind the back. This exercise should not be attempted until the student has excellent control of the back in the other positions, because of the difficult balance adjustment.[3]

2. *Development of Lower Back and Abdominal Control.*

(1) Hook lying position. Hollow the back and then press it flat to the floor. Repeat with the knees nearly straight.

(2) Hook lying position. Bend knees to the chest. Perform motion as though riding a bicycle, being careful to secure nearly complete hip extension on each stroke.

(3) Hook lying position, arms in reverse T position. Raise head, chin leading. (Student must maintain open throat on this exercise because of the severe abdominal strain.)

(4) Backward lying position. Abdominal breathing, keeping back in contact with the floor.

(5) Cross leg sitting position. Twist trunk from one side to the other, maintaining good head and shoulder position.

(6) Long sitting position, legs fully extended, hands behind neck. Raise chest and inhale. Lower chest and exhale. Do not relax the trunk from the hips. (Passive stretch of the lumbar region.)

(7) Kneeling position on hands and knees, hands turned out to avoid tendency to flexion in the elbows. Flex and extend spine as completely as possible, with particular emphasis on the lumbar region. After a certain degree of flexibility is obtained, place the emphasis on flexion rather than extension as in most cases extension does not need to be developed.[4]

(8) Same position as in (7) except that hands are turned out to allow elbow flexion. In this position more complete flexion and extension can be obtained.

(9) Same position as in (8). Free the hips and knees and work for complete flexion and extension in the lumbar region, initiating the movement in each case in the lumbar spine.[4]

(10) Standing on knees. Flex and extend the spine. Use the lumbar region to initiate the movement. Do not carry extension in the lumbar region beyond the correct postural position. (This exercise should not be given to a stout type individual because of the danger to the knee joint.)

(11) Knee-head position. Head resting on the floor insures a partial fixation of the upper back. Work for flexion in the lumbar region.[5]

3. *Development of the Entire Back. (Involving lateral flexion and rotation in addition to flexion and extension.)*

(1) Lying on the back with the legs extended and held down. (a) Flex trunk sideward as far as possible, letting head, shoulders and arms drag. Change position of arms (overhead, shoulder high, down at sides). (b) Same in prone lying position.

(2) (a) Backward lying position, arms stretched above head. Relax. Lift right hip and turn body as far over as possible without allowing shoulders to leave the floor. Relax slowly. Repeat with the left hip leading. (b) Prone lying position, arms stretched above head. Relax. Same exercise as in (a).

(3) (a) Backward lying position, arms stretched above head. Relax. Lift right shoulder (dragging arm) and turn body as far as possible without allowing hips to leave the floor. Relax. slowly. Repeat with the left shoulder leading. (b) Prone lying position, arms stretched above head. Relax. Same exercise.

(4) (a) Backward lying position, arms stretched above head. Relax. Lift head and rotate it to the right turning the body as far as possible. Relax slowly. (b) Prone lying position, arms stretched above head. Relax. Same exercise.

(5) (a) Backward lying position, arms stretched above head. Relax. Cross right leg over left. Rotate right leg inward strongly, from the hip, turning the body by this means as far as possible, without allowing the shoulders to leave the floor. (b) Prone lying position, arms stretched above head. Relax. Same exercise, except that leg rotates out instead of in.

(6) Prone lying position. Arms flexed at elbows and resting easily on the floor. With feet tight together, contract the outward rotators of the thighs strongly, at the same time tightening the abdominal muscles. Maintain this control of the pelvic tilt and raise the right hip, turning the body as far as possible without allowing the chest and shoulders to leave the floor. Relax slowly. Repeat, using the left hip.

(7) Long sitting position, arms relaxed at sides. Raise the chest high and twist the trunk to right and left. Do not allow knees to raise from the floor.

(8) Sitting on floor or chair. (a) Flex trunk from one side to the other, noting how free the movement is in the neck and how limited in the lumbar region. (b) Change feet to stride position. Flex body forward. (c) From stride position, flex trunk from side to side. (In this position more movement can be had in the lumbar spine.)

(9) Cross leg sitting position, hands easily joined behind back. Relax the head forward and then roll it around over the right shoulder, drop it back as far as possible, roll it forward over the left shoulder and relax. Make the movement as smooth and continuous as possible. Repeat to the left. (Very good for relaxation of the neck muscles.)

(10) Sitting on the floor in a cross legged position or on a stool. Twist the trunk, turning the head as far as possible. Repeat, attempting to concentrate the movement in one section of the spine at a time.[6]

(11) Standing against the wall, heels about six inches out from the wall. Flatten the back against the wall and then bend the trunk laterally as far as possible without any part of the back coming away from the wall.[7]

(12) Standing position. Twist the trunk as far as possible to the right and left. (a) With hips fixed. (b) With hips free but ankles fixed. (c) With ankles and hips free.[8]

(13) Circumduction. Explain how circumduction is a combination of flexion, extension, rotation and lateral bending. Take circumduction with different leads and try for wide range of free and complete movements; (a) Sitting position. (b) Kneeling position. (c) Stand-

[3] H'Doubler, Margaret, *The Dance and Its Place in Education*, Harcourt, Brace and Co., New York, 1925, 66.
[4] H'Doubler, Margaret, *The Dance and Its Place in Education*, Harcourt, Brace and Co., New York, 1925, 65.
[5] Ibid. 70.
[6] H'Doubler, Margaret, *The Dance and Its Place in Education*, Harcourt, Brace and Co., New York, 1925, 72.
[7] Roen, Susan, G., Head of Physiotherapy Department of the Children's Orthopedic Hospital School, Los Angeles, Calif.
[8] H'Doubler, Margaret, *The Dance and Its Place in Education*, Harcourt, Brace and Co., New York, 1925, 73.

ing position. (d) Lying across stool with partner holding feet.[9]

(14) Folding and Unfolding. (a) Folding. Standing position, feet parallel, one foot slightly in back of the other. Relax head forward and allow its weight to flex the spine very slowly. Arms should remain perfectly relaxed. Knees relax slowly until student rests on one knee and then on both knees. Sit back slowly on heels, head resting on the floor and arms perfectly relaxed. (b) Hold this position for a minute or two. (c) Unfolding. Raise hips until they are directly above knees. Keep arms and head perfectly relaxed. Pull with the lower back, drawing one foot up until weight can be placed upon it. Extend the knees slowly, (drawing up the other foot), keeping head and upper back so thoroughly relaxed that they are lower than the hips as long as possible. Do not use hands for balance. Slowly extend the spine until the erect position is assumed. Maintain correct pelvic tilt, but extend the thoracic and cervical spine for added height. Relax to easy, correct posture. (In case of a lateral deviation of the spine a keynote arm position may be assumed as spine is extended.)

B. Development of the Shoulder Girdle and Upper Limb. In the presentation of the technique for the development of the shoulder girdle, it would involve endless repetition to list every possible exercise. Suggestions are offered in the following pages, which involve starting positions and types of movements. The student, when once shown the possibilities will invent other combinations for herself.

The same type of music may be used for the fundamental movements of the shoulder girdle and upper limbs that was suggested for the movements of th trunk. The effort is to develop regulated coordination and build muscle strength.

1. *Control of the Movements of the Shoulder Girdle.*

(1) (a) Prone lying position. Go through the scapular movements: depression, elevation, abduction, adduction, rotation. *a* With arms at side. Palms up, palms down. *b* With arms shoulder high. *c* With arms overhead. (Explain that in this position the movement is a result of the rotation of the scapula.)[10]

(b) Backward lying position. Same movements. *a* With knees bent, to avoid hyperextension in the lumbar spine, especially in adduction and depression of the scapula. *b* With knees straight, if lower back can be controlled.[11]

(2) Sitting position with head resting on one flexed knee. The spine is fixed in this position and consequently localization in the shoulders is easier. (a) With arms hanging at side. All scapular movements. (b) With weight supported on the shoulders to bring in the element of gravity, which makes the movement more difficult and complex. All scapular movements.[12]

(3) (a) Cross leg sitting position; arms hanging at sides. All scapular movements. Localization is difficult in this position. (b) Cross leg sitting position, hands clasped behind back, elbows flexed. Same.

(4) Standing, arms relaxed at sides. All scapular movements.

2. *Control of the Movements of the Entire Arm by Means of Shoulder Girdle and Back Control.*

(1) (a) Prone lying position, arms overhead and lying on the floor, backs of hands together. Pull arm (with shoulder muscles) down to the sides, letting them be dragged along the floor.[13]

(2) Backward lying position, arms overhead and lying on the floor (palms facing). Same movements as in (1).

(3) (a) Backward lying position, arms stretched above head, knees flexed, lower back in contact with the floor. Take abduction and adduction of the entire arm. (Note tendency to hollow back.) (b) Same lying position, but with arms crossed in front. Same movement as in (a).[14]

(4) Flexion and extension in backward lying position. (Forward and forward downward pulling of the arms.) (a) Take with knees, bent, lumbar spine pressed against the floor. Repeat with legs extended. Take with shoulder lead and arm lead. (b) Arms relaxed on the floor at shoulder height. Bring the backs of the hands together over head by starting the pull in the scapular adductors and permitting the elbows to bend. (Keep arms always on the floor). With the backs of the hands together, stretch arms, hands and fingers to complete extension, starting the movement by the elevation of the shoulders. Spread arms to shoulder level.[15]

(5) (a) Cross leg sitting position, arms relaxed at sides. Extend the spine, at the same time adducting the scapulae strongly. Relax. (b) Same position; with hands joined behind back. Same movements.

(6) Sitting position with head forward on one flexed knee. Take flexion, extension, abduction and adduction of shoulder, attempting to localize the movement. Add scapular movements to these.[16]

(7) Cross leg sitting position, arms shoulder high. Arm circumduction using the scapular adductors and depressors to initiate the movement.

(8) Crawl position. Take any of the scapular movements.

(9) Sitting on edge of stool, extend the free leg back with the instep on the floor. If necessary, grasp the stool with the hand of the side that is on the stool. Raise body out of hips, guarding against hyperextension. Use arms, shoulders, and upper back in all possible movement.[17]

(10) From the following positions—lying, cross leg sitting, sitting on the heels, sitting on a stool, kneeling, half kneeling, crawling, and standing, combinations of shoulder, scapular, and upper back movements may be executed. It is interesting to use these studies as expression studies combining them with an analysis of rhythmic form. The manipulation of scarfs is also excellent for upper back and shoulder control.

3. *Control of the Arm and Hand.*

(1) Backward lying position, arms at sides. Analyze the possible movements of the finger, wrist and elbow joints. Hand—Flexion, extension, abduction, adduction, and circumduction of fingers and wrists. Forearm—Supination and pronation. Elbow—Flexion and extension. Study the possibilities of expression through the arm by emphasizing one movement in contrast to another and by accenting with different portions of the arm, (elbow, wrist, or fingers).

(2) In sitting, kneeling, crawling, and standing positions, combine the movements of the arm with the shoulder girdle and upper back. (a) Work for abso-

[9]H'Doubler, Margaret, *The Dance and Its Place in Education*, Harcourt, Brace and Co., New York, 1925, 73.
[10]H'Doubler, Margaret, *The Dance and Its Place in Education*, Harcourt, Brace and Co., New York, 1925, P. 73.
[11]H'Doubler, Margaret, *The Dance and Its Place in Education*, Harcourt, Brace and Co., New York, 1925, P. 76.
[12]Ibid. Pg. 76-77.
[13]H'Doubler, Margaret, *The Dance and Its Place in Education*, Harcourt, Brace and Co., New York, 1925, P. 82.
[14]H'Doubler, Margaret, *The Dance and Its Place in Education*, Harcourt, Brace and Co., New York, 1925, P. 83.
[15]Ibid. P. 83-84.
[16]H'Doubler, Margaret, *The Dance and Its Place in Education*, Harcourt, Brace and Co., New York, 1925, P. 84.
[17]Ibid. P. 89.

lute localization and increase of muscular strength. (b) Work for expression emphasizing extension, abduction, and outward rotation for their excellent effect on posture. (c) Work for eccentric expression using inverted movement, flexion, adduction and inward rotation. Take with varying degrees of energy, securing relaxation with extension. (Particularly good because of the abdominal control which can be obtained. Not good for correct postural position of the shoulder but it may be compensated for by using suggestions given under b).

C. *Development of the Pelvic Girdle and the Lower Limbs.* The same sequence of starting positions is followed in the development of the movements of the lower limb as was followed in the development of the trunk and shoulder girdle. The first work is offered in the lying position to eliminate weight bearing, the next in the sitting position and last in the standing positon. Great care must be taken in all foot and leg work to see that the feet are maintained in a parallel position, and that when weight is borne it is adjusted properly over the feet.

Effort must be made to develop strength for support and also agility to facilitate rhythmic adjustment. The term leg, in this section, is used to designate thigh, lower leg, and foot.

Suggestions for music for these fundamentals will be found in the section on music.

1. *Control of the Position of the Pelvis Involving Abdominal Muscles.*

The material for this control was presented under Section A, *TRUNK,* Division 2, *Development of Lower Back and Abdominal Control.*

2. *Development of Control of the Lower Limbs from the Hip Socket.*

(1) *Backward lying position.* Flexion of thighs—knees relaxed. Extension of thighs—Abdominals contracted. Abduction of thighs—against imagined resistance. Adduction of thighs—against imagined resistance. Rotation of thighs inward—against imagined resistance. Rotation of thighs outward—against imagined resistance.

(2) *Prone lying position.* Same movement.

(3) *Side lying position—Right.* R. elbow under R. side. R. knee flexed, abdominal muscles contracted. Flex, extend, abduct, adduct, rotate in, rotate out, circumduct the left leg. Hum to 3/4 or 6/8 time so there will be no danger of holding breath.

(4) *Side lying position.* Flex both knees to chest, extend knees and extend legs until body is in straight line. Slow 6/8 rhythm is good.

(5) *Backward lying—legs relaxed.* Vigorous contraction of the gluteal muscles. Relaxation.

(6) Prone lying. Same.

(7) *Backward lying.* (a) Rotate thigh in and out. (b) Rotate both thighs in and out. *Prone lying.* Same.

(8) *Long sitting position, arm support.* (a) Contract gluteal muscles with outward rotation; with outward rotation; without outward rotation. (b) Contract gluteal muscles with inward rotation; without inward rotation. (c) Same without arm support.

(9) *Long sitting.* Rotate thighs in and out slowly against imagined resistance.

(10) *Kneeling or Standing.* Contract gluteal muscles. Note control of pelvic tilt.[18]

(11) *Standing* (supported by partner or chair back). Weight maintained correctly on supporting foot. Flex, extend, abduct, adduct, rotate in, rotate out, circumduct the thigh.

3. *Development of Control of the Leg and Foot.*

(1) *Backward lying position, ankles strongly flexed.* Grip the buttocks together and rotate the thighs outward maintaining the feet in contact with each other.

(2) *Backward lying position.* Knees separated and bent to chest. Stretch both legs upward, steady thighs with hands, curl toes and bend ankles toward the body. Bend knees to chest and lower slowly to floor in flexed knee position.

(3) *Hook lying position.* Curl toes under. Turn balls of feet toward each other (heels stationary). Bend ankles upward and then relax.

(4) *Long sitting position.* Curl toes under, big toes touching, heels six inches apart. Flex feet and relax. Knees remain touching the floor, knee caps pointed upward.

(5) *Long sitting position.* Keep feet close together and stationary. Rotate the thigh outward.

(6) *Long sitting position.* Stretch the feet down, in, and up, making a semicircle, concentrating the movement on the in and up.

(7) *Heel cord stretch. Long sitting position.* (Partners) Partners face each other so that bottoms of feet are together and their own big toes and inner border of their own heels are touching. Without allowing the knees to bend, shake hands R. then L. with partner. Between each handshake, return to resting position, arms supporting weight. Care should be taken to see that students exhale as they go forward to shake hands as this is also a strong abdominal exercise.

(8) *Heel cord stretch. Standing position.* Feet parallel or toes slightly turned in. Flexion of knees and ankles (rotate thigh out as far as possible) without allowing heels to leave the floor.

The preceding pages offer suggestions for the development of control of the body segments, trunk, shoulder girdle and upper limbs, pelvic girdle and lower limbs. Many other arrangements of movements will suggest themselves to the student and physiotherapist as they use the material.

NATURAL TYPES OF LOCOMOTION

There are two main types of natural locomotion, based upon weight transference. There may be an even division of time alloted to each foot or an uneven division. Those movements involving an even division are crawling, walking, running and leaping. Those movements which involve an uneven transference of weight are sliding, skipping and galloping. Particular care must be taken to teach the elements of these movements correctly so that the body functions in the most efficient manner. In this section each movement is described fully, together with cautions which are useful in the presentation of it.

1. *Even Transference of Weight.*

(1) Crawl. Sit back on heels, trunk relaxed forward, arms relaxed in front of head. Stretch right leg back. (a) Crawl forward, using right leg and right arm. Secure complete extension by reaching forward as far as possible. Same with left leg and arm. (b) Crawl forward, using right leg and left arm. Repeat with left leg and right arm. (c) Crawl backward using right leg and right arm. Repeat with left leg and left arm. (d) Crawl backward using right leg and left arm. Repeat with left leg and right arm.

Caution—In teaching the crawl, be sure to emphasize keeping the spine in a flexed position with head relaxed until the full reach is accomplished to avoid hyperextension in the lower spine.

(2) *Walking.* Walking with straight foot position; arch held high. Stand feet parallel with thighs rotated out slightly to insure correct weight bearing over the

[18] H'Doubler, Margaret, *The Dance and Its Place in Education,* Harcourt, Brace and Co., New York, 1925, Pg. 92-93.

feet. 1—Step forward right, placing weight squarely on the heel. 2—Roll through outer border of foot transfering weight. 3—Grab floor with the toes. Same to the left.

Caution—Teach by count first and secure correct transference of body weight. Gradually increase speed and adjust to different music tempos.

(3) *Running.* (a) Heel, arch, toe walk increased to running speed. This is excellent for stretching the Tendo Achilles, when necessary. A slight pigeon toe position is advantageous providing it is an adduction from the ankle joint and not an inward rotation from the hip. (b) Running, toe first, but dropping to the heel to secure the maximum of ankle spring. Not advisable for all corrective cases.

(4) *Leaping.* Not suitable for corrective cases.

2. *Uneven Transference of Weight.*

(1) *Sliding.* (a) Forward with R. foot leading. Then L. foot. (b) Sideward with R. foot leading. Then L. foot. (c) Backward with R. foot leading. Then L. foot.

Variations may be made by changing the number of slides on each foot. An interesting floor pattern can be created by the use of slides alone, the only variation being the combinations. Care should be taken to emphasize correct weight bearing.

(2) *Skipping.* (a) For distance. (b) For height. (c) For pattern. Forward, sideward, backward, turning. Variations may be made in the same ways as for sliding.

Caution—Correct weight bearing on landing should be emphasized.

(3) *Galloping.* Involves more strenuous movement than sliding or skipping and is often not suitable for corrective cases. Where it can be used, the same caution concerning correct weight bearing should be observed.

DEVELOPMENT OF EXPRESSION STUDIES

After the fundamentals of body movement are mastered sufficiently to permit of some freedom of expression, the development of expression studies should be emphasized. The material for these studies should come from the students themselves. The instructor may guide the student by suggesting themes adjusted to the students' age level, but should not superimpose her ideas upon the student. If there is to be any value in this type of work it must be that of expression for the student. Through the development of expression in dance form the student may correlate her other interests. Art, music, history, English, etc., are very easily correlated.

Educational Dancing by its emphasis, on the development of the individual, physically, mentally and socially, is educating the entire person, not just the neuromuscular system. Bliss Carmen in his book *The Making of Personality* expresses this need:

Selecting exercises to serve the physical needs and defects of the student, so that it becomes a source of remedial development as well as a means of health; and by adapting that exercise to the student's own peculiar rhythm, either to correct or to emphasize it so that it becomes a naturally educative process, refreshing the personality as well as the physicality.[19]

The student needs an understanding of the elements of rhythmic form such as phrasing, pitch, tempo, accent, etc., in order to be free to use her body as an instrument for expression, and she will need to know how to use her body correctly mechanically. By using all of these tools she will develop power for expression, a feeling for pattern and a resulting poise.

[19]Carmen, Bliss, *The Making of Personality*, L. C. Page & Co., 1908. Second Impression.—137.

SUGGESTED TYPE OF LESSON PLAN FOR CORRECTIVE EDUCATIONAL DANCING

It is very important to keep the corrective aim in mind continually, in the presentation of educational dancing. At no time must mere skill in dancing be developed at the expense of correct body mechanics. What is excellent for one student, may not be the best for another, so great care must be taken to maintain an individual approach to the subject. To be sure, part of the value in dancing for these people is the opportunity for group work. Many group projects can be developed and should be, but not at the expense of any student.

In making a lesson plan for corrective educational dancing the following points should be kept in mind:

1. The psychological state of the students.
2. The social adjustment of the students.
3. The physical condition of the students from an organic viewpoint.
4. The physical state of the students from a body mechanics viewpoint, including neuromuscular control.
5. The interests of the students.
6. The necessity for the development of a liking for educational dancing. In other words, consider the theory of concomitant learning.
7. Developmental work for each student, corrective in nature.
8. Group projects, also developmental in character, for the individuals concerned.
9. The stimulation of the energy, initiative and originality of each student.
10. The emotional satisfaction which is obtained from work well done and which has been a satisfactory expression of the individual.
11. The development of an understanding of music in the relation to intellect, body movement and expression.

In the development of each lesson, so much depends upon the individual or group, and the results of their medical and postural examinations, that only a very general plan can be offered.

1. An activity which will serve as a stimulation to the circulation should be offered. The heel, arch, toe walk done to slow, moderate, fast and very fast tempo is an example. (Correct walking position, time and the meaning of tempo can be taught through this activity.)

2. Floor work in segmental body control. Group work in control of the trunk. A form of rolling might be used. Individual work, planned for the segmental control most needed by each student. Two or three studies. (All may be done to slow 6/8 rhythm.)

3. Expression study. A problem of flexion and extension of the entire body (from floor to standing position) might be worked out emphasizing correct body control and the development of a dramatic problem. Each student will work this out differently and has an excellent opportunity to use his own originality and initiative.

4. Group dance using simple folk dance formations, which may be determined by the group. An entire study, using slides, runs and whirling might be used. The problem of phrasing will have to be solved by the students and forms an excellent opportunity for emphasis on this part of rhythmic form and analysis.

5. Relaxation in a position which is restful and corrective for each individual for at least three minutes.

Lesson plans of like construction can be planned to give progression in all of the controls, skills and desirable social adjustments.

The physiotherapist who uses rhythmical activities

must of course have an adequate background in anatomy, kinesiology and physiology, but in addition she must know something of music construction and the art form of the dance. It is the opportunity to mould the individual physically, mentally and socially that is the value of the dance in the treatment of the posture case. If carefully handled, the psychological value of the dancing approach can be of great assistance in the treatment of the child who has neurotic tendencies.

In summary, the preliminary work for segmental body control is presented first, in the lying down position, later in the kneeling or sitting position and last in standing and moving positions. In this way control is gained before weight is borne. The material presented in the work for segmental control of the body is based upon the same theories as that of the corrective exercises now in use in physiotherapy. Additions from the dancing field which are particularly applicable, have been made. The material is to be used in the same way corrective exercises are used, observing the same cautions. Progress in educational dancing as in corrective exercise programs is slow at first, as muscle strength and coordination need to be developed simultaneously. This work on fundamentals cannot be called dancing but is a preparation for it.

The natural types of locomotion are studied, because one of the problems of posture correction is to perfect body mechanics in moving positions. Those forms involving even transference of weight, are studied first. These are the walk, run, leap and hop. Usually a posture case would not be given the leap because there is too much danger of jar and strain. The uneven forms of transference of weight are presented next. These are the skip, slide and gallop.

In any corrective exercise, smoothness of action and rhythmic control are emphasized. In Educational Dance technique, the student has the aid of music to help her in a rhythmic adjustment. An understanding of rhythmic form will aid the student to use her body intelligently and in a rhythmic manner.

After a certain amount of mastery of the fundamentals of body control is obtained, including: segmental control; the even and uneven forms of locomotion; and the derived steps, polka, two-step, schottische, waltz and mazurka; the student is ready for expression in the form of simple dramatic studies and dances. The writer has emphasized repeatedly, the fact, that the expression must be the student's own, (of her personality and experience) and not a form superimposed by the instructor. It is through the use of the dance form that the physical, mental, emotional and social tendencies are all brought together. It is then that the entire individual is absorbed in the task at hand. Every motor control the student has mastered is useful, when she begins dance composition. Any lack of control is noticed quickly and serves as an additional incentive for working on fundamental movements.

Music appropriate for the development of Educational dancing as a corrective physical education procedure is important. It must be of the best if it is to act as a stimulus for the student's best efforts. The writer presents a bibliography of music which is adapted to the work and has been arranged in a working outline.

The problem of devising lesson plans which will provide adequate physical correction, mental stimulation and social opportunities is difficult. It is not practicable to set a routine, for the value of this work can only be according to its flexibility and adaptability to individual and group.

In conclusion, the writer offers Educational Dancing as a safe and interesting addition to the material desirable for use in the correction of the posture case program. It is an activity which is in keeping with the best enducational theory of the day. The activity is stimulating to the individual, physically, mentally, emotionally and socially and it is, therefore, an activity through which the student may gain all around development.

BIBLIOGRAPHY OF MUSIC FOR EDUCATIONAL DANCING

The music suggested in the following pages is arranged according to type of movement. The full titles of the books referred to, with their authors and publishers will be found later.

Even Movements

1. Walk: Slow—Heel, arch, toe—Garland, Nine Rhythms. Chanson Triste—Tschaekowsky, M. P. P., Vol. 2, p. 236.

Fast—Same as above, one step for each beat of the music.

March—Birthday March, Hofer II, p. 36. Dessaur March, Hofer II, p. 32. March of the Priests, Hofer II, p. 38. Marche Militaire, Hofer II, p. 26. Soldiers March, Hofer II. p. 20. Turkish March, Hofer II. p. 42.

Walks and Marches, Blue print Manuscript. Music, University of Wisconsin, Book I.

2. Run: From the knees—Rolling Hoops, Hofer II. From the hips—Chopin Circle, Colby. Hofer II, p. 3. Blue print Manuscript Music, University of Wisconsin, Book I, pp. 4, 5.

3. Leap: Marche Militaire, Hofer II, p. 26. Children's March—Schuman, Hofer, p. 5. Tournament, Hofer II. War Song, Hofer II. p. 24. Blue print Manuscript Music, University of Wisconsin, Vol. I, pp. 6, 7.

The leap is not an activity which should be given to every corrective physical education student.

Uneven Movements

1. Skip: Garland, Book II. 2/4 Hofer II, p. 62. 2/4 LaSalle, pp. 6, 25. 2/4 M. P. P., Vol. 2, p. 36 (fast). 3/4 Colby, p. 35. Colby, p. 45, part IV. 4/4 Hofer, p. 54. 6/8 (slow) Hofer, p. 102. 6/8 (fast) LaSalle, p. 25.

2. Sliding: Hofer II, p. 68. Colby, p. 82. Blue print Manuscript Music, University of Wisconsin, Book I, p. 8.

3. Gallop: Hofer, II, p. 43. Wild Rider, Schumann, p. 10. Hunting Song, Schumann, p. 9. Blue print Manuscript Music, University of Wisconsin, Book I, p. 8.

Derived Steps

1. Two Step: Hofer II, p. 56. Garland, Book II, p. 6.

2. Polka: Hofer II, p. 56. Garland, Book II, p. 6.

3. Schottische: Gilbert, Vol. I—Der Genuthliche. G. Weingarten, Op. 119, p. 28.

4. Waltz: Smooth—Chopin Waltz, No. 2 (Last 16 meas. of part I), p. 13, Edition Wood. Accented—Chopin Waltzes, No. 6 (Middle of p. 41), Edition Wood. Waltz Balance—Waltz Study III, Colby, p. 34. Waltz Turn—Greeting, Colby, p. 12.

5. Mazurka: Holje Dale (slow) Grieg, Op. 17, No. 19, M. P. P., Vol. p. 203. Mazurka—M. P. P., Vol. 8, p. 176. Mazurka—M. P. P., Vol. II, p. 256. Mazurka —M. P. P., Vol. II, p. 260. Hofer, Vol. II, pp. 70, 72.

Localization and Coordination Studies

Head—Rolling motion, 6/8 rhythm.

Back—Lying, sitting, standing—Flexion, extension and alternate bending. Sitting, standing—Rotation. Slow 6/8 rhythm. Au Matin—Godard, Vol. 8, p. 68.

Arms and hands—Lying, sitting, standing, walking—Flexion, extension. Rotation (shoulder and hand).

6/8 and 4/4 rhythm. Nocturne, Chopin, M. P. P., Vol. 2, p. 7. Barcarolle, Offenbach, M. P. P., Vol. 2, p. 221.

Legs and Feet—Lying, sitting, standing—Flexion, extension, Rotation (ankle and hip), 4/4, 6/8. Nocturne, Chopin, M. P. P., Vol. 2, p. 7. Barcarolle, Offenbach, M. P. P., Vol. 2, p. 221.

Rotation of Entire Body—Lying—Leading with hip—Berceuse, Dlebruck, M. P. P., Vol. 8, p. 39. Leading with shoulder—Cradle song, Ilyinsky, Vol. 8, p. 90, M. P. P. Standing—Same as lying. 6/8 rhythm particularly good for this type of work.

Relaxation—Curl up and grow—Garland, Nine Rhythms, No. IX. Morning Mood—Hofer I, p. 14. Relaxation of head and trunk—Elephant Walk, Hofer II. Cradle Song, Brahms, Hofer I, p. 106. Lullaby, Colby, p. 25.

Crawl—Melodie, Moskowski, M. P. P., Vol. 8, p. 135. La Cinquantaine, Gabriel-Marie, M. P. P., Vol. II, p. 13.

Flexion and Extension—3/4, 4/4, 6/8. Au Matin, Godard, M. P. P., Vol. 8, p. 58. Romance, Tschaikowsky, M. P. P., Vol. 8, p. 239. Cradle Song, Hauser, M. P. P., Vol. 2, p. 14. Simple Aveu, Thome, M. P. P., Vol. 2, p. 112. Schuberts Serenade, M. P. P., Vol. 2, p. 10.

Scarf Work—Quick: Blue Danube Waltz, Strauss (Sheet Music). Waltz from "Faust," Gounod, M. P. P., Vol. 2, p. 250. Waltz of the Flowers, Tschaikowsky, Nut Cracker Suite (Sheet Music). Slow: Schubert Waltz, Colby, p. 35. No. 3, "Three Waltzes," Schubert (Sheet Music). Brahms, A Flat, No. 5, LaSalle, p. 16. Improvision and Composition. Encourage the student to bring in music for this purpose. Victrola records are of great value here, as the student can work by himself if he wishes. Also, by the use of victrola records it is possible to present to the individual some of the best music of all times, played by artists of note.

COLLECTIONS OF MUSIC FOR EDUCATIONAL DANCING

Album for the Young, Schumann, Op. 68, Edition Wood.

Blueprint Manuscript Music, University of Wisconsin. Book I—Rhythms; Book II—Studies, Rhythms, Nursery Rhymes, Original Dance Compositions. Mrs. Mary Trumpff, 138 Breeze Terrace, Madison, Wisconsin.

Chopin Waltzes, Edition Wood, Wood Publishing Co., Boston, Mass.

Dance Etudes 34, Ruth Garland, 435 W. 119th St., New York City.

Modern Piano Pieces the Whole World Plays, Vol. II, VIII.

Music for the Child World, Hofer, Vol. I, II, Clayton F. Summy Co., Chicago.

Natural Dance Studies, Helen Norman Smith, A. S. Barnes & Co., New York City.

Natural Rhythms and Dances, Gertrude Colby, A. S. Barnes & Co., New York City.

Nine Rhythms for Dance Instruction, Ruth Garland.

Rhythms for Dance Instruction, Ruth Garland, Series II, III.

Rhythms and Dances for the Elementary Schools, Dorothy LaSalle, A. S. Barnes and Co., New York City.

Rhythms for Children, Mary Shafer and Mary Mosher, Columbia University.

The Dance in Education, Agnes and Lucille Marsh, A. S. Barnes and Co., New York City.

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Dewey, John, *Interest and Effort in Education,* Houghton, Mifflin Co., Boston, 1913, 101 p. Valuable to this study because of the desirability of applying these theories to corrective exercise.

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Gulick, Luther Halsey, *The Healthful Art of Dancing,* Doubleday, Page and Co., New York, 1910, 273 p.

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Lippitt, Louisa C., *Manual of Corrective Gymnastics,* The Macmillan Co., New York, 1923, 237 p. Contains material and cautions, valuable to corrective physical education.

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Practical Experiences in the Application of Muscle Training in the After Care of Poliomyelitis

By Marion Ballantyne, R. N., Orthopedic Supervisor, Winifred Johnston Hearn, B. S., Consultant, Visiting Nurse Association of Brooklyn, N. Y.

The purpose of this article is to bring to the attention of those interested in the after care treatment of poliomyelitis, and especially those new in the field, certain facts noted from practical experience, and the consideration of them in giving muscle re-education, based upon the fundamental positions outlined in "The Treatment of Infantile Paralysis" by Dr. Robert W. Lovett.

Therefore no space is being devoted to anatomy, for it is assumed that the one who intends to give muscle re-education, or to give instruction will have had an excellent background in that subject before contemplating doing such work. It is extremely important that one knows the origin and insertion of each muscle, as well as the action, as it functions in relation to the group. This background must also include a knowledge of the nervous system and the movement of all joints. It is essential that one have a working knowledge of child psychology and mental hygiene. With this information one is able to make an intelligent examination of muscles and plan a program of exercises. Experience has shown that an examination made by the physiotherapist in the home, or in an environment familiar to the patient, will disclose activities not determined by the physician. It is advisable to make examinations at intervals of two months. It is understood, of course, that these patients are under the supervision of a recognized physician. In general, better results are obtained if a member of the family is instructed in the routine treatment of the patient, which is the plan used by the Brooklyn Visiting Nurse Association. In this way the patient is able to receive treatment between the regular visits of the nurse.

The method employed by the writers in making examinations is to test for normal function. The inability of the muscle to function normally, is an indication for the need of re-education.

It is preferable to examine the patient stripped. If the patient can stand have him do so in order to observe his general posture; the maintenance of the physiologic curves, the effect the paralysis has upon his body balance, the weakness or deformity present in the affected area as a result of weight bearing. This is followed by a detailed examination of the parts in the positions of sitting, prone-lying, side-lying or back-lying depending upon the degree of power in the group being tested.

General Information for Giving Treatment

Massage

It is preferable to massage the affected parts at the beginning of the treatment, because of its stimulating effect upon the blood and lymph supply, which in turn increases the body temperature. Experience has shown that muscles function at a higher degree of efficiency when they are warm. This can also be effected by the application of non radiant heat—in the form of a heating pad. However, if there is extensive involvement or the child is very young with the characteristic short span of attention—it seems advisable to reverse the order of treatment by giving the exercises first. It is also advisable when arranging a program of exercises, to begin with the more badly affected muscle group. One must keep in mind that the essential point in giving muscle re-education, is to have the movement the result of a strong stimulus on the part of the patient. If there is great involvement there is a resultant loss of attention due to mental fatigue. Therefore, if a compromise must be made, it is desirous to have the patient's greatest cooperation when exercising the weaker group of muscles.

Massage should be given very lightly, with strokes directed toward the heart.

A more desirable result is obtained if the patient and masseuse assume positions devoid of stress or strain. The muscles of the patient should be completely relaxed, and the area affected kept in as normal a position as possible.

Water Treatment

In the recent poliomyelitis epidemic in New York City the use of salt water baths has been a great factor in the restoration of function and for its curative effect of the accompanying neuritis during the acute illness. Massage and muscle training may be given in the tank, or in the bath tub if the involvement permits and there is sufficient room to prevent interference in performing the exercises. One must guard against chilling the patient following this type of treatment.

1. Each exercise should have very definite elements of the movement that is to be transferred into practical use. For example: The anterior deltoid is needed to reach for something on the table. Make application between exercise and use apparent to child by incorporating the exercise in an activity that is an end in itself. This phase of re-education will be considered in another article.

2. If both groups of muscles controlling the movement of a joint are involved (flexors and extensors) each group should be exercised separately in order to impress the function of one group. For example: Quadriceps and Hamstrings affected. Complete actively exercising quadriceps before exercising hamstrings; and in each case the operator passively returns the part to original position for exercising the active group.

3. The amount of resistance given should depend upon the ease and correctness of the previously performed exercise. If one keeps in mind that there is a mechanical basis for grading exercises the reason appears more logical.

Muscle action is explained by the law of levers. Therefore the further away the resisting force is placed from the acting force, the more difficult it is to perform the movement. For example: The patient sits with the leg flexed over the edge of the table. With the resistance placed at the ankle he may be unable to raise the leg but if it is placed just below the knee, he will be more successful.

4. When allowing the patient to rest one must remember that a muscle tends to regenerate if the origin and insertion are brought closer together, therefore the part should be kept in a neutral position.

5. If more than one exercise is given for each group —reduce the number of times each exercise is given.

For example: Quadriceps—sitting on the edge of the table—raise the leg five times. Back-lying—Flex the thigh on abdomen and extend the leg on the thigh five times.

6. If the patient cannot perform more difficult exercises unaided, then he should be given exercises less difficult. If he does the latter with too great ease it can be made to fit his need by adding more resistance. For example: The patient cannot raise the leg against gravity (quadriceps). To exercise quadriceps horizontally is too easy. Then, add greater resistance to exercise done horizontally.

7. All movements should begin and end at a neutral position.

8. There should be as little change of position as possible, in performance of examination and exercises, in order to reduce fatigue, both physical and mental.

Examination and Exercises

1. *Toe Extension*—Back-lying, or sitting on the edge of the table, have the patient extend the toes, test strength with varying amounts of resistance.

Exercise—Same as test. *N. B.*—Movement should be confined only to the toes and not include any dorsiflexion of the foot. This is particularly true if the dorsal flexors are strong and tendo-achilles weak—(a calcaneous in evidence).

2. *Toe Flexion*—In same position have the patient flex toes, test with resistance.

Exercise—Same as test. *N. B.*—Movement should be confined only to the toes and not include any plantar flexion. Vigilance is required if equinus is present.

3. *Dorsal Flexion of Foot*—Sitting—have the patient dorsiflex the foot in neutral position without inversion or eversion and maintain it. Test with increasing resistance.

Exercise—Same as test. *N. B.*—If calcaneous is present the foot should only be dorsally flexed to right angle.

4. *Plantar Flexion*—Same position—have patient plantar flex the foot against resistance.

Exercise—Same as test. *N. B.*—(a) Be sure that the knee remains flexed and that there is no pushing from the knee or the hip. (b) See that this movement is not localized in the forefoot, as happens if flexors of toes and forefoot are good, but takes place primarily at the ankle. Movement in forefoot increases tendency to cavus. If patient cannot pull up oscalsis do it passively. (c) If either tibialis posticus or peroneus longus and brevious are strong, exercise them as an aid in plantar flexion.

5. *Inversion*—Sitting—have the patient invert and dorsally flex the foot.

Exercise—Same as test. *N. B.*—(a) If tendency to calcaneous is present, protect the heel. (b) If dorsal flexors are strong, localize movement to inversion only, with the foot flexed at right angle. (c) When the Extensor Longus Hallucis is obliged to perform the major part of inversion, the toes should be flexed. Otherwise, the great toe tends to extend and the metatarsal joint is dropped.

6. *Eversion.*—Same position—have the patient evert the foot. *Exercise*—Same as test. *N. B.*—(a) If peroneustertius is weak, execute inversion with a minimum of dorsal flexion. (b) Observe that extensor communis digitorum does not perform major portion of the function.

It seems preferable to give the exercises with the patient in the positions as indicated in order to make transfer of activity into normal use clear to the patient. If necessary give assistance in all foot exercises. In the opinion of the writers all foot exercises may be performed against gravity, even though assistance is necessary, for it keeps the foot in a more normal relation to the body and its function. They believe that such a procedure does not tend to develop undesirable movements. This does not include exercises for the knee and the hip.

7. *Knee Extension*—Sitting over the edge of the table—extend the knee.

Exercise—(a) Same as test—or: (b) Sitting with the knee extended, contract the quadriceps. The patella jerk gives the patient an idea of the function of the quadriceps when bearing weight. The explanation can be given that this activity is required when standing to keep the knee from bending. (c) If the quadriceps is strong enough to work against gravity but the hamstrings are weak, allow the leg to hang over the edge of the table, hold the thigh firmly against the table and have the patient raise the leg until it is almost extended. This will help to eliminate a recurvatum. Furthermore—if the leg externally rotates, guide it in a correct position with the hand. (d) Horizontally on affected side.

N. B.—Keep thigh in line with the trunk. There should be no help from the hip flexors. Keep the lower leg flat on the table otherwise the leg is externally rotated and the rotators assist in the movement.

8. *Hip Flexion—Supine position*—Flex the thigh on the body with the knee flexed.

Exercise—(a) Same as test. *N. B.*—Guide the thigh in a straight line to eliminate movement in external rotation; and in analyzing the act of walking the patient must be instructed that the thigh should be brought up in a straight line. For one does not walk with the thighs in "frog position." (b) Horizontally.

N. B.—The knee should be flexed if recurvatum or weak hamstrings is present, otherwise the hamstrings are stretched. This may seem peculiar but as the knee is extended the action of the quadriceps is exaggerated in assisting the hip flexors; and so frequently the knee is hyperextended if the hamstrings are weak. Internal and external rotation of the hip joint are executed solely at the hip and care should be taken that the patient does not attempt to throw the leg with a movement of the trunk. If the patient needs assistance to execute any of these movements, the assisting hand should be placed a little above the knee. The legs should be kept flat on the table. If a deformity of the foot is present, the free hand should hold the foot in a neutral or corrected position.

9. *Abduction*—Side-lying position on unaffected side, raise affected leg.

Exercise—(a) Same as test. *N. B.*—The hip and the knee must remain extended.

(b) Supine position—abduct the leg. *N. B.*—If the hamstrings are weak and the quadriceps strong the latter group of muscles frequently contracts forcefully as the leg is abducted. This produces hyperextension of the knee and strain on the hamstrings. If the patient is unable to relax the quadriceps, it is suggested that the supporting hand be placed under the knee to slightly flex it. When the leg is abducted with the patient in the supine position there should be no external rotation of the leg. It may be noted that this problem is solved if the patient maintains the same position but flexes the hip and the knee and then abducts the leg. However, in the writer's opinion, in the performance of this exercise it is difficult to localize the movement to the weak abductors because gravity is involved and the abductors are contracted to prevent the thigh from striking the table. In this position the effect of gravity may be eliminated and the localized movement may be obtained by placing a supporting hand on the external side of the thigh and

advising the patient to push away the hand. Resistance may or may not be given. This is determined by the power of the abductors.

10.—*Adduction*—Side-lying on the affected side, the other leg held in position of abduction—raise the leg from the table with the knee extended.

Exercise—(a) Same as test. (b) Reverse position—gravity assisting. (c) Supine position adduct the leg. *N. B.*—Same suggestion as for abduction of the leg with the patient in supine position. (d) With the hip and the knee flexed the movement can be localized to adductors without difficult.

11. *Internal Rotation*—Supine position—internally rotate the thigh.

Exercise—Same as test. *N. B.*—(a) Keep the knee extended. (b) Keep the hip firmly on the table. (c) If equinus is present suggest that the patient dorsally flex the foot as there is a tendency to extend the foot and invert it. (d) Suggest that the patient extend the foot if the tendo-achilles is weak. (e) If the tendency to varus is present, the patient or worker should keep the foot in the corrected position. (f) If Valgus is present emphasize the tendency to invert the foot.

12. *Knee Flexion*—Prone-lying. Have the patient flex the knee.

Exercise—(a) Prone-lying. This is not indicated if movement of the leg is unsteady. (b) Side-lying. Flex the knee.

N. B.—(a) The thigh should be in a straight line with the trunk. If the hip is flexed the hamstrings are stretched over a greater distance. Therefore, flexion is more difficult. There should be no movement in the hip. (b) If the external hamstring is weak, flex the knee over the edge of the table and externally rotate the leg. (c) Reverse for weak internal hamstrings. These two movements require a fine degree of coordination but with care and patience, on the part of the instructor, children can grasp the idea. (d) Guard against all movements of postures which place the weight on the hamstrings.

For Example: The mother should not raise the entire leg off the table and brace the foot against her body when lacing the shoe.

13. *Hip Extensnion*—Prone-lying. Raise the leg from the table—the knee extended.

Exercise—(a) Same as test. *N. B.*—Not indicated if the hamstrings are weak.

(b) Gripping the buttocks. *N. B.*—The ability to perform this movement is important in the upright position when correcting posture. It also gives the idea of the function of the gluteals in walking and stair climbing and in controlling a gluteal limp.

(c) *Horizontally*—Side-lying; on affected side. Start with the hip and the knee flexed at right angles and have the patient push the leg back and finish with the thigh in line with the trunk, unless the patient can execute this exercise with the knee extended, which is more difficult, because the resisting force is further removed from the acting force. The knee should be flexed if the hamstrings are weak. *N. B.*—The leg and the thigh remain on the table throughout the exercise.

This is the first of a series of articles. The next will contain similar suggestions in connection with exercises for the upper extremity, back and abdomen which are the result of observations made in the field.

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EDITORIALS

Executive Committee's Column

The first regular meeting of the Executive Committee of the American Physiotherapy Association was held in Chicago July 16, 1932, an irregular meeting held in August.

Thanks are due to past officers for the splendid work they have done in laying the foundation upon which we, as an organization, stand and to each succeeding committee which has taken over the business of the Association and continued to carry our standards and ideals higher and higher. It is through the wise council of the Medical Profession and the cooperation of members, Chapter officers and the untiring efforts of National officers that we have been able to accomplish the things we have.

We are to be congratulated in having five physicians who stand for the very highest in the Medical Profession on the Advisory Board: Dr. John S. Coulter, 122 So. Michigan Ave., Chicago (Chairman); Dr. Ludvig Hektoen, 637 So. Wood St., Chicago; Dr. Dallas B. Phemister, University of Chicago Clinics, Chicago; Dr. Frederick Gaenslen, 425 East Wisconsin Ave., Milwaukee, Wis.; Dr. Wallace H. Cole, Miller Clinic, St. Paul, Minn.

The Committee has accepted the invitation from the Chicago Chapter to meet with them for the 1933 Convention. One look at Chicago's sky line and the outside

of the unusually interesting buildings which have been erected for the Chicago Exposition will make you decide to be there.

Those of you who attended the convention in Milwaukee heard the proposal and discussion that we have regional conventions. Out of that proposal has come what seems to be an excellent plan that is that Sectional meetings be held early in 1933, January or February. One in the West with Miss Catherine Worthingham, 340 So. 16th St., San Jose, Calif., as Chairman of Program Committee and one in the East with Miss Constance Greene, 53 Burpee Road, Swampscott, Mass., as Chairman.

These Sectional Meetings perhaps could be held at the same time and place as the State Hospital and Occupational Therapy Conventions. They, of course, will be short but will give more members a chance to attend a convention, stimulate interest and afford an opportunity to discuss questions to be brought up at the Annual Convention and instruct Chapter or Sectional Delegates.

There will be an Executive Committee meeting in October. We urge you to send in suggestions and confide your troubles to us as we want to serve the National Organization.

MARTHA E. HINDMAN, *Second Vice President.*

The Massachusetts Physiotherapy Association, Inc., has had many good friends among the medical profession, and has felt it keenly when their helpful personalities were withdrawn from us.

How do we more deeply regret than the passing of Dr. Edward Wyllis Taylor, who gave us of his thought, strength and time in the last year of his life, in a course of lectures that we might better understand the intricacies of the nervous system, and so be more efficient in our work.

Dr. Taylor's kindly personality and patient understanding of our problems endeared him to all of us and we wish to acknowledge our debt of gratitude to him, and our sympathy to his family.

C. W. E.

Sept. 2, 1932.

We are Proud of Our Chapter

Would it be out of place in an editorial for our western number of THE REVIEW to tell something of our chapter, that of Northern California? We shall refrain from being the real Californiacs by claiming that we have the biggest and the best chapter. We have neither the biggest nor the best but we are proud of our chapter because we do keep together in spite of almost insurmountable difficulties.

We have thirty-seven members. Some live over fifty miles away and at least one-half of our members must take a train or ferry ride of over an hour to come to the meeting place, San Francisco. Our members serve the medical profession in a radius of seventy-five miles around San Francisco and some make regular trips of thirty miles or more to give a treatment. This is pleasant under our sunny skies but it isn't easy.

And our members do come to meetings. Why do they come such distances after a long day's work? Because the chapter is alive and has much to offer them. They want to come to hear our programs, to exchange ideas and to know each other.

We meet every other month, have a professional program either by a physician or a member and our final meeting of the year is always a social one with a dinner. We have a placement bureau and this year we voted our surplus treasury for a library. Our library consists of the standard books and magazines on Physiotherapy and subjects related to Physiotherapy. The plan is to charge a small rental fee until a book is paid for and to buy more books with the income, and each year to use any surplus in the treasury for our library.

We have no school of Physiotherapy. Since we have been unable to secure a school that attains the standards of the American Physiotherapy Association, we prefer none to one which would not serve our ideals. The fact that we have no school means that our members come from all sections of the globe—the east, the middle west, England, Canada, New Zealand and Europe. And so when we come together for our meetings we have a broadened outlook. We are not provincial, we have no prejudices of method or technic. Our meetings are the give and take of good fellowship. May we say again, we are proud of our chapter.

H. E. F.

General Statement of the Oregon State-Federation of Professional Societies

THE VITAL CHARACTER OF HIGH-TYPE PROFESSIONAL SERVICE

The professional men and women of the state comprise over 12,000 trained persons whose services are essential to the health, safety, and progress of our people. The physician, dentist, pharmacist, and nurse guard our health; the veterinarian protects the health of our domestic animals, and ensures the purity of our milk supply; the teacher is responsible for the development of the mind and character of our children; the engineer and architect are responsible for the safety and beauty of our homes and buildings; the certified public accountant protects the integrity and financial soundness of our business affairs; and other professional men and women render equally vital services.

PROFESSIONAL STANDARDS

In order to ensure that the quality of service is maintained in the interests of the public they serve, the professions of the state, through their own efforts, have established proper legal standards of character and education. These standards are continually under attack by those who are unable to meet the necessary requirements and seek to lower them to their own standard of preparation, irrespective of the public interest. In order to successfully resist these attacks the various professional societies have affiliated and propose to work as a unit in supporting candidates for public office who are honest and sympathetic to the enactment of sound professional legislation and the active enforcement of professional laws.

REPRESENTATION OF PROFESSIONS ON ADMINISTRATIVE BOARDS

A further object of the Federation is to secure the recognition of the professions in the administration of all laws dealing with matters in which the technical knowledge of the various professions is of particular value. This recognition may in some cases be secured by providing for the appointment of one or more members of the interested professions to an administrative board, and in other cases by the creation of a board of professional men serving without compensation in an advisory capacity to an administrative board.

SELF-GOVERNMENT BY SELF-SUSTAINING PROFESSIONAL BOARDS

The Federation will work diligently to keep the present control over professional license and annual registration fees in the hands of the various independent boards of professional examiners. During recent years, numerous legislative proposals have been presented to require these moneys, which are derived from fees voluntarily imposed by the various professions on their members, to be turned into the general fund of the state, and to allot to each professional board only such portion of these funds as the legislature may see fit to appropriate, the balance to be devoted to the general expenses of the state. The effect of such action could only be to cripple the enforcement of the various professional laws which are now diligently cared for at a minimum of expense by interested members of each particular profession. License and registration fees are paid by the various professions for the specific purpose of administering and enforcing professional laws. Any attempt to divert these funds to general state purposes is grossly unfair to professional people and is equivalent to levying a special occupational tax upon them.

(The Oregon Chapter of the A. P. A. is an affiliated society.)

At the eleventh annual convention of the A. P. A. an amendment to the Constitution was adopted which provided for the charging of $1 for each applicant to the Bureau of Appointments to help defray the expenses of the Bureau.

Therefore, in order to keep your names on the Active File for positions, will each applicant please send $1 to Miss Emily J. Griffin, Monmouth Memorial Hospital, Long Branch, N. J., the Director of the Bureau.

After the first of October all names will be dropped from the file unless the fee has been received.

EMILY J. GRIFFIN, *Chairman,*
Bureau of Appointments.

Symposium on Abdominal and Pelvic Conditions

Eleventh Annual Convention of the American Physiotherapy Association, Hotel Pfister, Milwaukee, Wis.

Josephine L. Rathbone, Presiding

MISS RATHBONE: One of the subjects about which every physiotherapist must keep informed is abdominal and pelvic disorders, and their treatment. We thought it would be worth our while at this convention to consider that subject, and we have asked some doctors to guide our thinking.

The first paper is by Dr. J. B. Carnett, of Philadelphia, and his associate, Dr. William Bates. Because of serious illness in Dr. Carnett's family the paper has not arrived in time for presentation this afternoon. Since I had the pleasure of hearing him give a paper similar to it in Philadelphia in April, I am going to take the privilege of telling you what Dr. Carnett reported at that time.

Miss Rathbone gave a brief résumé of Dr. Carnett's work, which she asked be not reported, since the original paper would appear in THE REVIEW. (See page 246 of this issue.)

The second paper is by one of our own members—Miss Emily J. Griffin, of Long Branch, N. J. (In the absence of Miss Griffin, Miss Rathbone read her contribution, entitled "Colonic Irrigation," and commented at the close upon Miss Griffin's marked enthusiasm for her work. (See page 250 of this issue.)

The next paper is by another of our members—Miss Lorraine Frost, of Iowa University. A few years ago, while I was at Wellesley College, it was my good pleasure to be associated with Dr. Norman Miller, then of the University of Iowa, in a study of dysmenorrhea. Miss Lorraine Frost was a student at Wellesley while that study was going on, so she also knew about it in the initial stages. She is going to tell us about work subsequent to that started by Dr. Miller at Iowa. (See page 251 of this issue.)

Perhaps you are all conscious of the fact that we are very fortunate this afternoon in having so many doctors who are willing to appear on a program with non-medical people. I consider that the absent doctors who sent contributions have appeared on this program. Dr. G. G. Deaver, of the Y. M. C. A. College in Chicago, is willing to tell us about some work that he has been doing. It is critical work, but that is exactly what we need in this field. People are too disposed to follow one method of treatment which seems to be satisfactory for a few cases, and use that method for all cases. People in educational institutions have an opportunity to hear about a great many studies; and part of Dr. Deaver's work is to keep in touch with those studies, to analyze them, and to pass on to students the benefit of his mature judgment on these various problems. (Dr. Deaver's paper appears on page 254 of this issue.)

If Dr. Deaver had said nothing but that part about abdominal exercise, he would have made a great contribution to this symposium. There is no subject more mistreated in the field of physical exercise than abdominal exercises. Will Dr. Deaver please answer questions about electrotherapy techniques?

DR. DEAVER: I happened to be up in the woods in Geneva when I prepared this paper, and I couldn't get material on electrotherapy, but from what I have read on it I would say that we are just as bad off as we are in these other things I have suggested in my paper. In the first place, there are so many variables; various types of constipation, first, and, secondly, various types of currents and modes of currents, that the literature is absolutely misleading. The spastic and atonic types of constipation are different, and people have reported success who have been treating the atonic type, implying that the success has been had with both types.

QUESTION: I wonder if Dr. Deaver could tell us about the effect of electric stimulation, using a wave generator.

DR. DEAVER: I don't know anything about it.

MISS RATHBONE: Someone says that Miss

Adams has had some experience with that modality.

MISS EMILY ADAMS (Detroit): Any of the Army girls can tell you the same thing I can. We used the Morse wave machine with a pad on the back, and I believe we moved the active pole so many minutes on the ascending, so many on the transverse, and so many on the descending colon. I was just a student at Walter Reed then, and not at all capable of judging results. The patients seemed to feel that they got good results then. I do know from my professional experience in that type of thing that we certainly should not use it in spastic cases. I think a very fine diagnosis should be made before we ever attempt that type of work.

DR. DEAVER: I was at the General Electric Company to see a machine they had with a sine current. They published in their handbook that one electrode should be put on the back at a certain portion of the spine and one on the front. They were so interested in it that they called Dr. Carlson and me to examine it. Dr. Carlson disproved the statement that you could move the contents of the colon by that type of sinusoidal current.

MISS RATHBONE: Finally we shall hear from Dr. Edmund Jacobson, of Chicago. We have a great many good friends in the medical profession, and among them some who do not know a great deal about us. Dr. Jacobson is in the latter group. That is one reason why I wanted him here; so that he may get acquainted with us while we are learning from him.

Dr. Jacobson, I know, has a great deal to tell us from his own practice, not only with spastic conditions, but with other conditions not diagnosed spastic by the ordinary physician. Dr. Jacobson is talking absolutely informally, and I think that he would be willing to have you question him at any time. (See page 257 of this issue, for Dr. Jacobson's comments, and the informal discussion from the floor.)

Body Mechanics in Relation to Ptosis of the Abdominal Organs and to Abdominal Pain and Tenderness

By John Berton Carnett, M. D., Professor of Surgery in the Graduate School of Medicine of the University of Pennsylvania, and William Bates, M. D., Assistant Professor of Surgery in the Graduate School of Medicine of the University of Pennsylvania

Paper read before the American Physiotherapy Association at Milwaukee on June 30, 1932

Early in our professional life as general surgeons we were impressed by the high percentage of abdominal operations which failed to relieve the dominant symptoms of abdominal pain and tenderness from which the patients had sought relief.

After prolonged study we found that pain and tenderness which were unrelieved by abdominal operations almost invariably were located in the abdominal wall itself. Unfortunately physicians have not been taught to search the abdominal wall and when pain and tenderness are located therein they are wrongly ascribed to some non-existent lesion of an underlying intraabdominal organ. Removal of real or fancied disease in the underlying organ does not benefit the overlying pain and tenderness. Many patients undergo as many as a dozen abdominal operations without relief from pain and tenderness which are not recognized as being located in the abdominal wall itself.

We proceeded to devise a variety of tests for abdominal pain and tenderness[1] which will differentiate those located in the abdominal wall itself from those located inside the abdominal cavity. We will refer only to the two main tests used in this differentiation. Physicians the world over are taught to make an abdominal examination only when the patient's abdominal muscles are completely relaxed but by that method it is not possible to recognize tenderness located in the abdominal wall. We advise for every patient having abdominal pain or tenderness that one stage of the examination should consist of the patient holding his abdominal muscles as tense as possible while the examiner repeats firm palpation pressure over the tender area. The patient's tense abdominal muscles prevent the examiner's fingers coming in contact with any of the abdominal viscera and any tenderness found over tense muscles is necessarily located in the abdominal wall itself. A correct interpretation of the results obtained by this simple little test would save numerous patients from needless abdominal operations.

The second test consists in pinching a liberal fold of abdominal skin and fat between the examiner's thumb and one or two fingers. Undue sensitiveness is an indication of the pain and tenderness being located in the abdominal wall. This second test is not so constantly reliable as the first because in a small percentage of patients the skin and fat may be only normally sensitive whereas the first test will show that the muscles are hypersensitive.

The proper application of these tests discloses that in more than fifty percent of the patients having abdominal pain and tenderness these symptoms are located in the abdominal wall and have no relation whatsoever with any lesion inside the abdominal cavity.

We next sought for the cause of the pain and tenderness in the abdominal wall and found it to be neuralgia. The entire nerve supply of the abdominal wall comes from the lower seven intercostal and the first lumbar nerves. Irritation near the spinal origin of any one or more of these nerves is very common and may give rise to pain and tenderness in any one part or all of the abdominal wall and result in a picture closely resembling any intraabdominal lesion in which pain and tenderness are prominent symptoms.

The main causes of neuralgia are primarily excessive lumbar lordosis and to a lesser extent scoliosis and spinal arthritis. Our search for the best method of overcoming sway back or exaggerated lumbar lordosis led to our adoption of the special exercises devised by Goldthwait and his associates. Anyone not familiar with these exercises will find them described in Thomas' Body Mechanics and Health[2] and in Cochrane's Orthopaedic Surgery.[3]

Training patients in the special exercises not only accomplished our primary object of dispelling neuralgic pain and tenderness in the abdominal wall but gave unanticipated relief from various digestive disturbances including constipation due to ptosis and atony of the stomach and intestines. We then came to realize that excessive lumbar lordosis is simply one phase of bad body mechanics which latter has been defined by a White House Conference Committee[4] as "The mechanical correlation of the various systems of the body with special reference to the skeletal, muscular and visceral systems and their neurologic associations. Normal body mechanics may be said to obtain when this mechanical correlation is most favorable to the function of these systems."

Faulty body mechanics in sthenic individuals is relatively uncommon and usually does not involve the abdominal wall nor the abdominal viscera. We will therefore limit our discussion to the bad body mechanics found in the asthenic type of individuals.

The illustrations (Figs. 1 to 10) indicate some of the anatomical changes which take place when an individual improves his body mechanics. The backache and upper abdominal pain and tenderness which this man had when he first came under observation have disappeared. In figure 1 the hollow back, round shoulders, forward head and flattened chest indicate a grade D posture which improves to the B grade (Fig. 2) by tightening the buttock and lower abdominal muscles and drawing in the chin but leaving the shoulder muscles relaxed. In the great majority of instances round shoulders are the result of compensation for the increased spinal curve of exaggerated lumbar lordosis. Correction of the lumbar lordosis in itself automatically corrects the round shoulders provided contractured pectoral muscles do not play a part and require special treatment. A child with round shoulders should receive parental admonition to "pull in the tummy" rather than to "throw back the shoulders." The pernicious effect of trying to correct round shoulders by "throwing the shoulders back" is shown by the increased lumbar lordosis in figure 3.

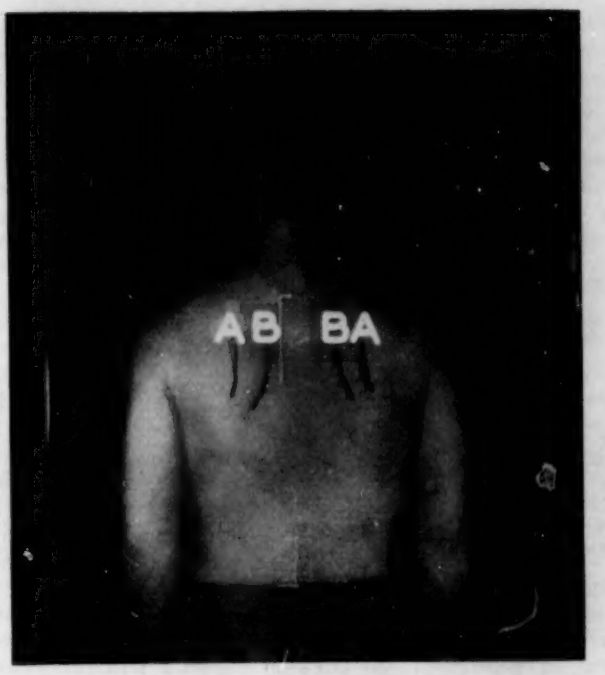

Fig. 4
VERTEBRAL BORDER OF SCAPULAS: A A IN NATURAL POSITION AND BB IN IMPROVED POSTURE

In figure 4 the vertebral border of each scapula is shown by the lines AA which are 7½ inches apart in natural posture and by lines BB 6 inches apart in the improved posture (Fig. 2) in which the photograph was taken. In the position of holding the shoulders back without tightening the buttock and abdominal muscles (Fig. 3) the interscapular distance is only 2 inches.

The circumferential outline of the chest at the xiphoid level in natural posture (Fig. 5B) measures 33½ inches and is increased laterally and antero-posteriorly in improved posture (Fig. 5A) to 34½ inches. Tracings of the spine from the base of the skull to the coccyx taken by means of a lead strip show the lumbar curve of natural posture (Fig. 5D) is decreased 2½ inches in depth by improved posture (Fig. 5C).

The angle formed between the costal arches where they join the sternum is 46° in poor posture (Fig. 5FKF) and 69° in improved posture (Fig. 5 EKE). For ideal body mechanics this angle should be increased to an obtuse one by having the patient hook his fingers around the costal arches and spread them apart during his exercises.

The lateral roentgenograms were all made with the patient standing and with the film at the same distance from the floor in each instance. Figures 6 and 8 were made in natural or slump posture and figures 7 and 9 improved posture. In figure 6 the bodies of the lumbar vertebrae resemble a pile of youngster's building blocks that have begun to buckle. Under superimposed weight the blocks fly to all parts

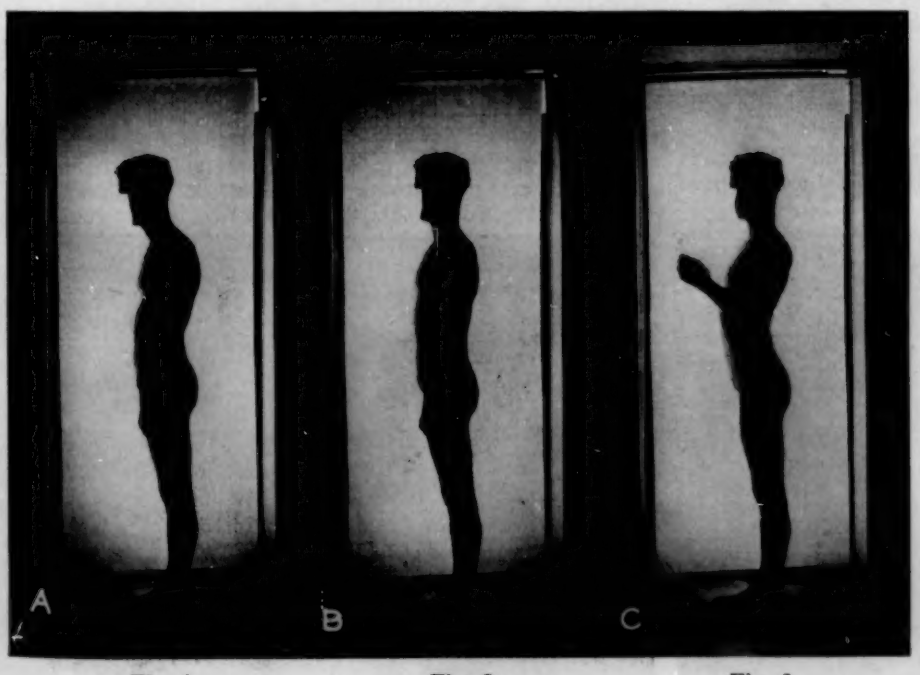

Fig. 1
NATURAL POSTURE

Fig. 2
IMPROVED POSTURE

Fig. 3
BACKWARD THROWING OF SHOULDERS INCREASES LUMBAR LORDOSIS

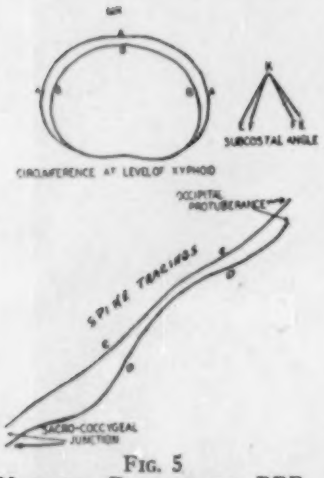

FIG. 5
NATURAL POSTURE IN BBB, DD AND FKF. IMPROVED POSTURE IN AAA, CC AND EKE

of the room but the bodies of the vertebrae are prevented from following a similar course by ligaments attached to their front and sides which are under constant stress and strain whenever the patient is on his feet. This patient had tenderness of every part of the bodies of the lumbar vertebrae, intervertebral discs and sacro-iliac joints that could be palpated through the anterior abdominal wall as commonly found in excessive lordosis and which one of us has described in a paper on Chronic Strain of the Lumbar Spine and Sacro-Iliac Joints[6]. The mechanical disadvantage of weight bearing by the buckled lumbar spine is obvious and explains the frequent complaints of weakness, lameness or aching of the back in patients with excessive lordosis. In figure 7 the lumbar vertebrae approach a vertical line and the weight is borne more directly on their bodies and intervertebral discs with far less strain on ligaments and muscles.

In figures 6 and 7 the line AB is drawn from the posterior lower edge of the twelfth thoracic vertebra to the posterior upper edge of the sacrum and is then continued downward to C which is on a level with the tip of the coccyx at D. The line BE is the top of the sacrum. Comparison of figures 5 and 6 discloses (1) the distance of 8½ inches from A to B is increased by improved posture to 9 inches which means one-half inch added to the patient's height by partial straightening of the lumbar curve; (2) the 1¼ inches distance of the third lumbar vertebra from the line AB is reduced to ½ of an inch in improved posture; (3) rotation of the pelvis on the heads of the femurs as an axis causes the coccyx (a) to descend one inch as shown by the difference in length of the lines BC, and (b) to approach the line BC 1⅛ inches as shown by the difference in length of the lines DC; (4) the angle CBE becomes less acute; and (5) the prominence of the buttocks is decreased.

The fallen stomach (Fig. 8) rises a full six inches to a relatively normal position (Fig. 9) by improvement in posture. The transverse colon and the hepatic and splenic flexures of the colon were elevated 3 inches as shown by fluoroscopic examination in this patient. In other patients we have repeatedly seen elevation of the ptosed diaphragm, small intestines and kidney. In the majority of patients the raising of ptosed abdominal organs is accomplished by posture treatment better than by the surgical operations of suspension.

The distance from the floor to various easily recognizable anatomical points are given in figure 10. The full height increases only ¾ of an inch due to partial straightening of the spinal curves in the lumbar and cervico-dorsal regions. The symphysis pubis however rises 1¼ inches due to the same rotation of the pelvis which causes the coccyx to descend an inch (Fig. 6 and 7). The xiphoid and the suprasternal notch rise 1¼ inches,—½ inch of which is due to straightening the lumbar curve and ¾ inch is due to an upward rotation of the ribs at their attachment to the spine.

The changes which have been enumerated make for greater efficiency of the individual in many different directions. This discussion however is concerned only with the effect on the abdomen. Normally the abdominal cavity, exclusive of the pelvis, should have the conformation of an egg with the large end upward. In bad posture or bad body mechanics the upper abdominal cavity is narrowed laterally and antero-posteriorly by the downward rotation of the ribs, by the falling of the diaphragm and by the forward bulging of the lordotic lumbar spine. The abdominal viscera all gravitate downward and the abdominal cavity in the more severe cases assumes the shape of an egg with the large end downward. Visceroptosis may be due to causes other than excessive lumbar lordosis but in excessive lordosis visceroptosis is always present. The function of the ptosed viscera is impaired by their displacement and by the venous congestion incident to restricted diaphragmatic action.

Symptoms may be present from childhood as in the cases of cyclic vomiting reported by Brown. Often the stamina of youth offsets the impaired visceral function and symptoms do not appear until later in life. We have had no experience with patients similar to those reported by several competent observers[3] in which sugar or albumen in the urine due to functional disturbances of the pancreas or kidney was not influenced by diet but disappeared on correction of bad body mechanics. Ptosis is a common cause for atony of the stomach and colon. Atony is responsible for many diverse symptoms of indigestion which are not

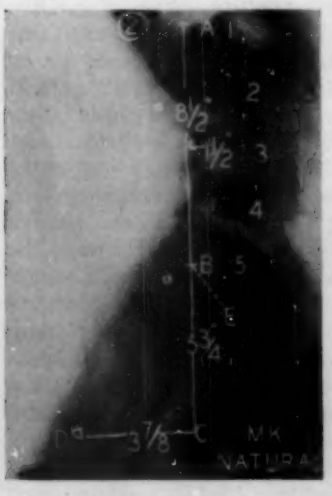

FIG. 6
NATURAL OR SLUMP POSTURE

FIG. 7
IMPROVED POSTURE

FIG. 8
NATURAL POSTURE

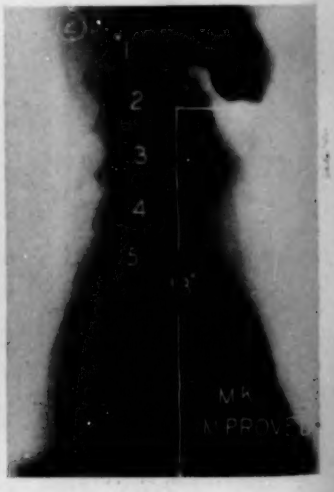

FIG. 9
IMPROVED POSTURE

materially benefited by diet, drugs and visceroptosis belts but which improve or disappear on correction of faulty body mechanics. Atony from ptosis of the colon is a frequent cause of constipation. One of our visceroptotic patients, in spite of diet, cathartics and simple enemas ordered by a gastro-enterologist, suffered from headaches and general depression unless a physiotherapist administered a colonic irrigation every third or fourth day. She had to restrain her desire to spend her vacations in the country or smaller resorts where a physiotherapist was not available. She proved unusually adept in learning the exercises for correction of her faulty mechanics. After only four lessons she rapidly improved her posture and lost her severe backache and abdominal pain and tenderness. For the past two years she has not had a colonic irrigation and has not taken a cathartic other than a teaspoonful of mineral oil at night but has had daily bowel movements and is in excellent health.

Miss Leah C. Thomas informs us that in her training of college girls in body mechanics the most enthusiastic group is composed of girls with dysmenorrhoea about 85% of whom become pain free after three or four months of active exercises.

In other papers[4-9] one of us has described how various combinations of indigestion symptoms and of pain and tenderness in the abdominal wall due to faulty body mechanics may be mistaken for acute or chronic appendicitis, gall stones, kidney stones, ulcer of the stomach, colitis, pancreatitis, diseases of the ovaries or Fallopian tubes, adhesions, hernia and acute or tuberculous peritonitis. One or more operations for any of these conditions in which a real lesion may or may not be found commonly fail to cure visceroptotic indigestion and neuralgic pain of the abdominal wall, yet these symptoms usually subside under posture treatment.

The degree of lordosis is easily determined by observing the greatest depth of the space between a wall and the lumbar spine while the patient is standing with his heels three inches from the wall and with his buttocks, shoulders and head touching the wall. Normally this space should barely admit the examiner's flat fingers but in very bad posture the closed fist may be inserted. In the patient employed for illustration of this paper the space from the wall to the lumbar spine barely admits a sheet of paper in the improved posture but is 2½ inches in depth in the natural or slump posture. The disappearance of the space is due to a ⅝ inch backward replacement of the lumbar spine (Figs. 6 & 7) and to a 1⅞ inch forward movement of the buttocks incident to pelvic rotation. The great majority of adults and children exhibit excessive lumbar curvature as shown by the above test and their general well being would be promoted by improvement in their body mechanics. The best time for prevention or correction of faulty body mechanics is in childhood before abnormal elongation of some muscles and ligaments and contractures of others occur.

We are convinced that no form of exercise in itself will correct bad posture or faulty body mechanics. Special exercises are imperative as a first step to elongate shortened muscles and ligaments and to shorten elongated ones and to teach the patient sufficient neuromuscular control to render him posture conscious.

Good results in the correction of bad posture are directly dependent upon the faithlessness with which at all times the patient holds himself in the good posture taught by the special exercises. Neglect to hold good posture between the exercise periods inevitably means failure. The maintenance of good posture means definite mental and physical effort until it becomes automatic and habitual. Several patients whom we have had report recently for x-ray studies have volunteered the remark that they now find it difficult to throw themselves into their original slump postures. Our views on the correction of faulty body mechanics have been published at greater length elsewhere[10].

In patients with scoliosis we always examine for a short leg and if one is found a suitable lift to equalize the length of the two legs is placed on the heel of the shoe on the short side. Mild scoliosis may disappear by heel elevation alone or by employing the exercises for improving body mechanics but the severer grades of transitional scoliosis generally require appropriate modification of the exercises.

Spinal arthritis demands treatment for its underlying cause if it can be found. Acute cases commonly require rest but the chronic cases usually are benefited by exercises and by mild x-ray treatments, massage, diathermy or other forms of heat applied to the spine.

A correct understanding of the principles of body mechanics and a proper knowledge of the correct way to prevent or correct faulty body mechanics will enable physiotherapists and physical directors to reduce the number of chronic invalids who haunt physicians' offices.

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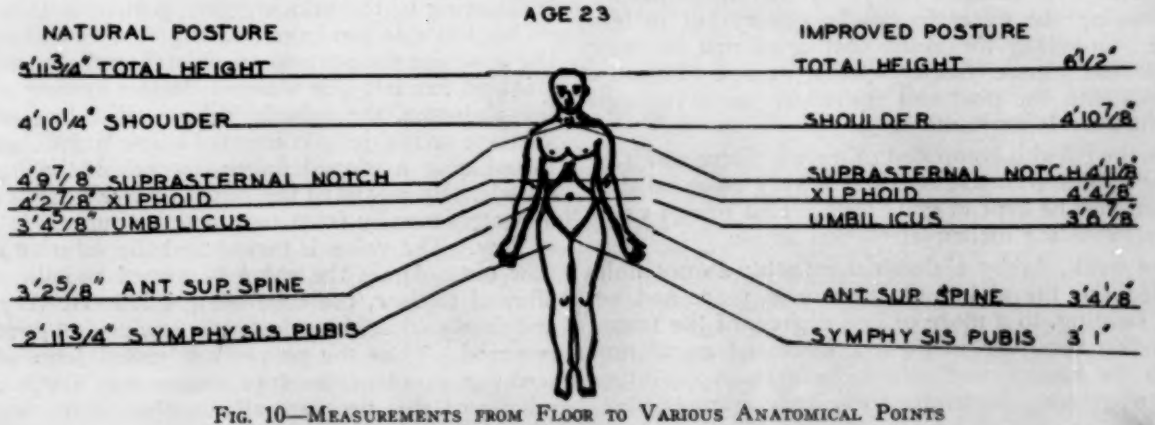

FIG. 10—MEASUREMENTS FROM FLOOR TO VARIOUS ANATOMICAL POINTS

Internal Hydrotherapy

By Miss Emily J. Griffin

No symposium on conditions pertaining to the abdominal cavity would be complete without a discussion of Internal Hydrotherapy or Colonic Therapy. The mere mention of this subject is a challenge for much controversy for there are almost as many who condemn as there are those who approve.

To my mind this in itself is a good point, for it proves that colonic therapy is not just a fad and an opportunity for a certain type of person to make "quick money" but a very decided therapy which, in the wrong hands, may do great harm. Nor is colonic therapy the sort of treatment which is indicated in every type of abdominal pain.

We are all perfectly familiar with the anatomy of the large bowel, the part of the gastro-intestinal tract with which we are chiefly concerned at present. We know that the material which passes from the small intestine through the ilio-caecal valve into the caecum, is in a liquid state. On its journey up to the hepatic flexure and across the transverse colon the water is largely absorbed and the fecal material becomes firm and well formed. This process should take approximately 14 hours. About 4 additional hours for food to pass from the mouth to the caecum, makes a total of 18 hours for the passage from the mouth to the anus.

Of very great importance is regularity in habits of eating, sleeping and consequently evacuating. During the night digestion is slowed and the resumption of bodily activity in the morning is one of the means by which the bowels are made to act regularly.

When the hours of eating and sleeping are irregular and there is no time allowed between breakfast and the rush for the train or office the regular habits of the bowel are broken in upon with very sad consequences.

Waste material, instead of being carried away, remains in the colon and becomes putrified, and a tremendous source of infection. Dr. Lamp claims that 80% of cases of infection may be traced to the large bowel.

Even one bowel movement a day does not disprove constipation. Some of the worst cases report one regular movement and quite insist that they can not possibly be constipated. The large bowel may be likened to an iron pipe through which water passes. The pipe, through neglect, becomes rusty. A coating forms inside allowing the water to flow regularly but in less volume. Gradually the inside coating of rust becomes so thick that a mere trickle of water passes. The rust soon eats into the pipe and the water seeps through into whatever is surrounding it.

Since the colon is composed of muscle fibers and held in place by other muscle fibers, it is very essential that these muscles be kept in good tone. This brings us to another cause for incomplete bowel action.

These weak, flabby abdominal muscles do not hold the colon nor the abdominal viscera in place and we have a sagging, to a more or less degree, of the transverse colon resulting in greatly increased angulation of both the hepatic and splenic flexures—a condition known as ptosis. Naturally these very cramped flexures practically prevent the passage of any material, and again we have the picture of the rusty pipe.

The colon muscle itself loses its muscle tone, becomes weak, and, because constantly over-stretched by impaction, loses its ability to strongly contract and move the bowel contents along—loss of peristalsis.

Now that we have drawn this very sad picture, what is to be done? A small boy is sent home to his mother with a very dirty face. To restore it to its normal, healthy glow, the mother thoroughly washes the face, especially in the corners and behind the ears. This is exactly what we do to our sick, weak and very "dirty" colon.

The patient complaining of constipation or any abdominal disability should be sent at once to his physician who, after a thorough physical examination, makes all necessary tests, takes x-rays after barium or bismuth meal and enema, if that is necessary; and studies all possible reasons for disability. In the last few years colonic therapy has become very popular and is being practiced by persons other than physicians. This in itself is not at all a bad feature, for in most cases these persons are well trained, *but no person should be treated by anyone without first having been examined by his physician.* Then such errors as irrigating in the presence of unrecognized cancer of the rectum would never be made. The patient should be sent to the person giving the irrigation with a complete diagnosis, x-ray report and prescription calling for certain medication and there should be frequent conferences between the operator and the physician.

In another article I described quite in detail a modern, scientific colonic unit consisting of a table, toilet bowl directly connected with the drain, 3 perculators for solution and a 3-way valve for the control of the solution to the patient and the return of material from the patient. The flow is always under control so there is never any danger of overdistending the bowel.

There are many methods and ways of giving a colonic irrigation. I find the following method most effective and simple. The patient removes her clothing and puts on a gown. She then lies on the table on her back with her knees drawn up and a light abdominal massage is given for the purpose of relaxing the muscles of the abdomen and softening the packed colon. Some form of radiant heat used in conjunction with this is most helpful as heat always relaxes and is comforting to the patient. The patient is then turned on her left side and an enema is given. She sits up over the bowl for the purpose of emptying the lower bowel. Back on her left side with an electric heating pad over her abdomen, the colonic tube well lubricated with vaseline or KY jelly is inserted a few inches, after first introducing a gloved finger to relax the sphincter muscle. By means of the control valve a small amount of water, usually from two to three ounces, is allowed to flow. The valve is turned and the solution and gas flow out. Again the valve is opened and the solution allowed to flow, the tube being advanced very gently and firmly while the solution is flowing but never when reversed. Thus the properly adjusted force of water pushing ahead of the tube makes way for it and the release of this pressure allows that from within to

force the water back, bringing fecal material with it. This process is continued throughout the entire treatment, great care being taken when passing through and around the flexures as too great haste may cause the tube to kink or turn back upon itself. One can sometimes feel the tube being pulled through the sigmoid flexure. With very few exceptions it is not generally considered necessary to insert the end of the tube beyond the sigmoid flexure, as the x-ray has proven that a bismuth enema will pass on over into the caecum. Should the patient complain of pain the valve is immediately turned as a gas pocket may have been reached or, for some other reason, there is too much pressure. At no time does the colon become distended by too much water as the return flow is carefully watched. It sometimes is necessary to slightly withdraw the tube as the opening may become blocked. From time to time the abdomen is gently massaged, always at the return flow, in the general direction of the colon, that is from right to left, thus minimizing any pressure against peristalsis.

After the splenic flexure has been passed the patient is turned over on her back thus helping the solution to flow through the transverse colon. Our aim is to reach the caecum as there most of the trouble lies, but this is rarely accomplished in the first few treatments, sometimes never, due to spasticity and adhesions. If it is possible to reach the caecum turning the patient on the right side will help the flow in that direction. Usually the original nervous tension of the patient is overcome and the tube may be advanced quite easily. Here is an excellent opportunity for the practice of psychology. By well directed conversation the patient's mind may be diverted and relaxation much more easily accomplished.

By this time the perculators may need refilling as the return must be clear or nearly so before the irrigation stops, though of course there are exceptions, due to weakness or very severe conditions. Very frequently the first treatment can not be continued until the return flow is clear, for the colon has been so thoroughly packed that quantities of water would be required and the patient would tire. Then again, after illness, it is not advisable to stir things up too radically. It is always well to advise the patient that the more severe the reaction the greater is the need of treatment. This fact is perfectly evident when one stops to consider that infection to any degree can not be stirred up and set in motion without a certain amount getting into the system and causing temporary trouble.

Should there be any medication to follow it is not considered wise to begin implantation until several treatments have been given. The foci of infection being much stronger than the beneficial germs of the medication, the fight will be too one-sided. Quite frequently Bacillus Acidophilus is ordered and this can be put into one of the small perculators and implanted as well into the caecum as possible and allowed to remain for at least 15 minutes. The question of medication is a most important one but must rest entirely in the hands of the physician. He knows the type of infection with which he is dealing and that when the whole colon is entirely free from infection unless proper remedial germs are implanted the last state of that colon may be worse than the first.

After the irrigation the patient is taken to a rest room where she is told to lie quietly and relax for at least fifteen minutes. Then, if ordered, a few well chosen exercises are given for abdominal tone and strength, these to be done regularly at home as well.

The ideal colonic therapy, beside removing old, infectious material from the colon, aims to return the individual's muscle tone and bowel action to as near normal as possible and thus do away with further treatment. This is quite the opposite to "Cathartic Therapy" which usually has to increase its doses as the effect is lessened. The initial treatments are given daily for about four days then reduced as rapidly as possible until finally only one a month is needed. Usually even that is stopped and the patient continues to have normal, regular bowel action.

Naturally diet, activity and rest are carefully watched and supervised by the physician.

Long Branch, N. J.

Dysmenorrhea and Exercise

By Miss Lorraine Frost

"Pain associated with menstruation is conceded by nearly all gynecologists to be of one of the most complex of our unsolved problems." (Sellers) Statistics present varying evidence, some showing a frequency as low as 16%, others as high as 75%, the average being about 50%. Whether the incidence of dysmenorrhea is on the increase due to the high tension of present day living, whether more cases are being brought to the attention of the gynecologist, or whether the frequency has actually decreased as a result of the lack of restriction from clothing, of the increased participation of girls and young women in outdoor activity, and of the generally saner attitude toward this normal body function, it nevertheless remains a problem of major importance from both the individual and economic standpoint.

As an instructor in Corrective Physical Education, I must of necessity place the emphasis of this discussion on treatment by non-medical measures, namely general health and hygiene, in which exercise, both general and special, is given a place of primary importance. Although electrotherapy, in our own field of Physiotherapy, has made valuable contributions to the treatment of menstrual disorders, a discussion of this phase on my part would lack the foundation of actual experience. Again, we are well aware of the infinite possibilities of the part played by the endocrine glands in regulating menstruation and in producing abnormalities. The general lack of agreement surrounding this subject (with respect to the relative importance of the various glands, especially the ovaries, thyroid, and pituitary, and with respect to the merits of specific means of treatment, and the apparent absence of satisfactory extracts) place it still in a class of treatment which will become more dependable only with further understanding of the physiology of menstruation—both normal and pathological,—with the possibility of more accurate diagnosis, and with improved laboratory methods.

In order intelligently to discuss the role of exercise,

a brief resume of the more generally accepted etiology will not be out of place, though once again we find much controversy here as elsewhere. By definition dysmenorrhea means difficult or painful menstruation, the subjective symptoms varying from a marked sensation of heaviness in the lower abdomen and pelvis, a dull ache in the lower back, which may or may not extend down into the thighs, to intermittent, severe cramps localized in the pelvis. Headache, nausea, and general nervous irritability are frequently related symptoms. We shall limit ourselves entirely to primary, or essential, dysmenorrhea, where no actual pathology or specific cause for the condition is known to exist. This is the type most generally met with among girls and young women in school and industry, and this type alone may be expected to respond to non-medical or non-surgical treatment. Adequate means for its alleviation would be most important from the social and economic standpoint.

Probably the simplest classification of causes, and one long in use, divides most cases into two types, spasmodic and congestive. The immediate cause of the pain in the first is found in a muscular spasm of the circular fibers surrounding the internal os. The most commonly cited cause of muscle spasm is the presence of some form of obstruction between the cervix and fundus. This may take the form of an extreme angle of flexation, either ante-or retro-flexion, or of failure of reflex relaxation and slight dilatation of the cervix. The high incidence of symptomless cases of anteflexed, retroflexed, and retroverted uterus tend to the belief that in most cases this is only a contributing cause. Pain in the second type is produced by undue congestion in the pelvic region, especially in the uterus. Eliminating actual pathology productive of congestion, such as inflammation, disease, or faulty structure, the remaining possible causes are numerous; first, the negative effect of gravity on the circulation of the abdominal and pelvic regions in the upright posture; second, the inactivity of much of our present-day life with its consequent lowering of circulatory efficiency, muscle tone, and body mechanics; and, finally, faulty personal hygiene, in which constipation plays an important part. Dr. Norman Miller, formerly of the State University of Iowa, now of the University of Michigan, whose contributions we will take up in greater detail, writes, "When a state of chronic congestion exists in individuals . . . . we may expect that the superimposing of the physiological congestion of menstruation on an already congested group of pelvic organs will result in discomfort and untoward symptoms."

Only to mention these factors leads logically to a discussion of exercise and its place in treatment, for is it not generally accepted that regular exercise exerts a favorable influence on the very factors here at fault—circulation, muscle tone, and general mechanical and physiological efficiency?

Dr. Miller, in contrasting the circulation of the blood in quadrupeds and bipeds with respect to the effect of gravity, shows that in the latter more than one-half of the total volume of the blood is below the level of the heart. He asserts that this produces a state of mild, chronic, congestion in the lower regions. A further handicap is the absence of valves from the large veins of the pelvis and abdomen, the presence of which in the veins of other parts of the body tends to offset the downward pull of gravity to a certain degree.

Good skeletal muscle tone is conceded an important factor in the mechanical stimulation of the circulation, as well as an index to the tone of the smooth muscle of the various systems of the body. Emphasis is placed especially on good abdominal muscle tones, important from the standpoint of maintaining the normal position and relationship of the abdominal and pelvic organs, thus avoiding further cause of congestion. It is also of primary importance in the maintenance of normal intra-abdominal pressure, with its stimulating effect on the functioning of the organs and blood vessels. By exercise muscle tone and habitual body posture may be improved, constipation may be eliminated, local congestion may be relieved in part by the demands of the peripheral circulation, and nervous irritability may be decreased with a consequent raising of the threshold for pain stimulation. Finally the very participation in exercise, with little or no change in the daily routine during the menstrual period, will tend to develop a more desirable attitude of the individual toward menstruation in the light of a normally, painless process, and so help to eliminate a common psychic factor contributing to an exaggeration of symptoms.

Dr. Miller has probably been the first to make any intensive study of the possible relationship between dysmenorrhea, and body posture and muscle tone. Only a preliminary discussion of his work, carried on over a period of four years, has so far been published. The group studied originally numbered 785 students and nurses (1927), but was decreased by the beginning of the fourth year to 495, the remainder having left college or gone elsewhere before their senior year. Of the original number 237, or 47%, had dysmenorrhea, 17% of which had severe pain to the extent that they were forced to miss work and, in most cases, go to bed, seeking relief in palliative measures. Periodic histories were taken, and records were kept of body posture and muscle tone. It is interesting to note that three-quarters of those without dysmenorrhea had good muscle tone, a much higher percentage than the other group showed. At the end of three years 127, or 53%, reported no menstrual pain, 29, or 12% had pain in a lesser degree, and 81, the remaining 34%, showed no change. Most of the students had had a short period of special posture work along with their regular Physical Education requirement during the first two years. Dr. Miller concludes his article, "While it cannot be said that a faulty posture or poor muscle tone causes dysmenorrhea, our study reveals a decrease in the occurrence of dysmenorrhea coincident with improvement in posture and muscle tone." Though menstrual pain is apparently unrelated to specific body posture so far as the practical results of his study show, Dr. Miller definitely decries the emphasis which he believes those trained to supervise posture work have placed in the past on a decrease in the lumbar curve with its accompanying decrease in pelvic obliquity. Regardless of the justification for his criticism, it is reasonable to believe that such a position of the trunk on the pelvis does remove, partially at least, the support afforded the abdominal organs by the pelvic brim forcing their weight directly on the pelvic organs below. Such abnormal pressure presents an additional factor to an existing state of congestion. A flattened lumbar curve may also be a definite contributing factor in retroversion.

The work of Dr. Clelia Mosher, one of the earliest advocates of the use of exercise in the treatment of dysmenorrhea, is well known. Even today, some twenty years later, however, the value of such treatment remains for the most part empiric, physicians and gynecologists using it only as a supplementary measure in most cases. It is true that on a theoretical basis most agree as to the desirability of exercise. Dr.

Sellers, of New Orleans, who has made an extensive survey of the subject of dysmenorrhea, writes, "Judging from the views expressed in the literature, and from my personal experience, both exercise and exercises, are indicated, if properly directed in the majority of cases of dysmenorrhea." And we read in an article by Dr. C. F. Miller, "There is no more valuable prophylactic measure than regular daily exercise, such as work in a gymnasium, tennis, riding, walking; and such exercise should be continued, in moderation at least, through the actual flow."

Although regular activity in the form of golf, tennis, or even a vigorous walk, is invaluable from the standpoint of general health and efficiency, special exercises demanding localized muscle action have been found more successful in persistent cases. The so-called "Mosher" exercise, first used by Dr. Mosher, has found extensive use. It consists of a slow, rhythmic lifting and lowering of the abdominal wall by means of an alternate contraction of the abdominal muscles, and of the diaphragm, the latter producing a movement of the relaxed abdomen upward. Its value undoubtedly lies in its stimulation of the circulation primarily by the specific pumping action of the diaphragm on the large veins returning the blood to the heart, in its massage action on the abdominal organs, and in its tendency to help in the improvement of abdominal tone. This latter is of course furthered by more strenuous exercise of these muscles. Although Dr. Mosher claimed excellent results from the use of this exercise alone, some 10-20 times twice daily, it is usually only one of a group of prescribed exercises. Chief among the others is the prone knee-chest exercise, based on the position of the same name which is widely used in the treatment of pelvic conditions. From a position on hands and knees (a little apart) with arms and thighs vertical, the chest is lowered as far as possible, the trunk is then circled back toward the heels, and upward and forward to the original position. Emphasis is placed on maintenance of contraction of the abdominal muscles throughout. The exercise is performed 10-12 times, and then the position is held passively for 5-10 minutes. The advantage of the position in reversing the effect of gravity on the circulation, and of eliminating the downward pull of gravity on the body organs needs no more than mention. This effect is especially beneficial in dysmenorrhea from the standpoint of helping both to relieve congestion and pressure, and to reduce the angle of flexion between fundus and cervix. The part played by retroversion of the uterus as a fundamental cause of dysmenorrhea is debatable. When it is a contributing factor, however, exercise could have very little real value except where the condition is temporary.

Other special exercises consist of those for strengthening the abdominal muscles, and stimulating the circulation of the large muscles of the trunk, namely those that involve trunk twisting and bending. Exercises done with the body position inverted are usually included, such as air bicycle or scissors exercise done from a shoulder stand position. Posture training is emphasized where indicated.

Needless to say, consistent cooperation on the part of the individual is necessary to insure any degree of success. The importance of the daily performance of the exercises should be repeatedly emphasized. No results may usually be expected until the second month at the earliest. The exercise program should be continued over a period of at least 6-10 months in some cases to obtain results, in others, to insure permanence where early results are apparent. Where no other form of activity is possible it should be followed indefinitely. This of course demands patience and will-power on the part of the individual. The exercises can be printed or mimeographed in convenient form.

Dr. A. Anderson Clow, a widely-known advocate of this form of treatment in England, has worked out a set of exercises which she has found to yield favorable results. They involve relatively the same movements as those mentioned above, vigorous twistings and bendings. Emphasis is placed on their performance especially a few days before the period and for one or two days after the onset of flow. She reports that in a twenty year period she has had 400 cases markedly relieved or cured. We read in a recent article in the British Medical Journal, "I must add that nothing short of actual experience in the severe cases would have convinced me of the universally beneficial effect of exercise during the period, vigorous enough to make the patient feel hot." This is consistent with the remarks of some of the more keenly observant students who have dysmenorrhea, but who have discovered for themselves that the pain is definitely less if, instead of indulging in rest in bed, they take a brisk walk or participate in some form of activity.

In the past two years I have been able to keep relatively complete records of some 80 students who have been recommended by the Medical Advisor for special exercise work for dysmenorrhea of moderate or severe degree. The ages ranged from 16-26 years. Of this group 24, or 30%, at the time of their entrance into class gave a history of irregularity as well as of pain, there apparently being no relationship with the severity of the latter, however. The intervals between periods ranged from two weeks to six months, the average for the group being 28 days. In the first history, 35, or 45%, gave a history of severe pain. In 11 cases this lasted for two days or more, time usually being lost from regular work. Constipation was present in 25 cases, or 31%, the condition being chronic in all but 4 instances. Its occurrence was apparently unrelated to the time of menstruation, or to the degree of pain present. With respect to posture, 21, or 26%, were graded as good, 29, or 36%, as fair, the same percentage being classed as poor. However, some of the most severe dysmenorrhea existed in individuals with the best posture. In about 30% of the cases the lumbar curve was considered decreased, although in only a very few cases was it flat. As this condition is equally common in cases of no dysmenorrhea it points to the belief that it alone is not the cause. Attempt to increase pelvic obliquity and the lumbar curve in the habitual posture of the individual met with discouraging results. No endeavor was made to record muscle tone.

At the end of the period of individual work in class, a period varying with individuals from 2-8 months, 27, or 33%, showed complete relief of symptoms, 32, or 40%, showed varying degree of improvement, 13 or 16%, showed no change, and of 8 there is no record at that time. Speaking in general, success is proportionate to the degree of persistence in performing the exercises on the part of the individual.

A second history, consisting of 68 of the original, taken within this last month, at a time anywhere from 2 to 16 months after the preceding record in individual cases, showed only 9, or 13%, who reported no recurrence of pain. A like number reported pain only at infrequent intervals. 26 reported slight or moderate dysmenorrhea, and the same number showed a record

of pain of the same degree, or greater than originally. 11 of the original 24 cases of irregularity reported regularity. Only eight had continued with regular exercises, although the majority were having some exercise three times a week in the physical education classes. 24 reported doing the exercises at irregular intervals, usually after an especially painful period. Many volunteered the information that the exercises had helped, but that they could not always find the time to do them. Five students had had some form of endocrine therapy at the physician's advice, but with no apparent results, and a few persistent cases had undergone thorough pelvic examination, for which excellent facilities are offered by the University Health Service. In no cases, however, were the findings positive.

Despite the apparent lack of proof offered by the figures of this group which is of course far too small to present any conclusive evidence, I remain in perfect accord with those who advocate the use of exercise as of lasting value—where no contraindications are present. I am convinced that failure in many, if not most cases, was due to the fact that the exercises were taken only three times a week, and were discontinued entirely when that brief period of supervision was over. In other cases the individual was unwilling or unable to change her habits of living, especially with respect to irregular hours, diet, and overwork. Dr. Sellers has said, "The fact that great mental strain and actual physical fatigue are capable in themselves of causing dysmenorrhea has been impressed upon me in the observation of a large number of college girls and teachers during the latter part of the school year." It has been interesting to me to observe the increase in symptoms toward the end of a semester with the approach of the examination period when the amount of study, worry, and mental strain is generally increased.

I have made no mention of the part played by psychic factors in producing menstrual pain. Most physical therapists and physical educators should recognize their limitations in dealing with mental hygiene in any form. Although the University includes a staff of highly trained psychiatrists, attention to this factor has so far played no significant role in treatment.

It is fitting to close with a few remarks concerning the prevention of this condition—in so far as this is possible. This may be brought about first by parent education, that the subject of menstruation may be presented to the growing girl in the light of a normal body function, necessitating no temporary alteration in the daily routine, and accepted as such by her. In the second place the development of the child must be directed toward desirable habits of living in the way of personal hygiene, body mechanics and exercise habits so deeply rooted that they will withstand the demands of the complicated existence of later life.

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Some Physical Therapeutic Methods in the Treatment of Constipation

By G. G. Deaver, M. D.

When food is taken into the mouth and swallowed, there is started a series of physical and chemical actions which research workers have been investigating for many years. As the food travels through the alimentary canal it is pushed and churned and acted upon by many kinds of chemicals in order to obtain from it the last gram of nutriment for the body needs. Though this disintegrating process functions in a very efficient manner there is always a residue which must be eliminated. It is the method of elimination from the body of this residue upon which we are to focus our attention.

Mayo demonstrated that this residue is held at the recto-sigmoid angle until the time for defication occurs. It would seem that under normal conditions the rectum is free from fecal matter except during the act of defication.[1]

When the fecal matter enters the rectum the desire to deficate is provoked. Just what is involved in this defication is not clear but it seems to be due to a purely intrinsic mechanism. Golz in his experiments with dogs showed that although he removed the spinal cord except in the upper thoracic region and the neck, after the dogs had recovered from the operation, they had a normal bowel movement once a day. This would seem to indicate that the lower bowel and rectum acted by means of some intrinsic mechanism.[2]

Just what stimulus is needed to start this defication reflex is not definitely known. Cowgill and Anderson have named four factors which may play a part in dogs.[3]

1. The amount of bulk of the material present in the lower bowel ready for elimination.

2. The actual pressure or distension that this mass may exert on the colon or rectal wall.

[1]Mayo, A. F., *Constipation and Allied Intestinal Disorders.* Oxford University Press, 1919.

[2]Golz, F., Arch. t.d.g. Physiol. 8:160, 1874.

[3]Cowgill, G. R., and Anderson, W. E., Jour. Am. Med. Assn. 98:1869 (May), 1932.

3. The area of intestinal wall that it may stimulate by contact.

4. Chemical stimulation of the colonic wall by substances in the fecal mass.

It is a question whether these factors are true for human beings who have formed habits of deficating at regular intervals.

Hurst thinks that this reflex is established by means of the "muscle sense" of the distended rectum. Whatever the exact mechanism is we know it is customary to empty the bowel once or twice daily. Usually this act is performed in the morning, and it is thought that the activities of dressing, taking of food into the stomach, habit, etc., start a mass movement and force some of the contents into the rectum, which until that time is empty. This gives the desire to deficate and urges one to the toilet where voluntary action comes into play to increase the intra-abdominal pressure and forces more fecas into the rectum. These in turn cause defication reflexes, which result in a great mass movement on the colon, activity of the rectal and levator ani muscles, corresponding relaxation of the anal sphincters and movements of the bowel. The normal stimuli to propulsion are eating, habit, and exercise. The normal stimulus to defication desire is fecas in the rectum.[4]

Hurst has demonstrated that about 33 hours time is required for a meal to be entirely evacuated from the gastro-intestinal tract. In the average healthy individual doing normal muscular work, food taken 9 hours before the act of defication should reach the splenic flexture and part of it appear in the fecas.

To summarize these physiological statements it would seem that:

1. It takes about 33 hours for an entire meal to be evacuated in a normal healthy individual.

2. The material to be evacuated is held at the recto-sigmoid angle until time for defication occurs.

3. When the fecal matter enters the rectum the desire to deficate is provided.

4. This desire or defication reflex seems to be due to a purely intrinsic nervous mechanism in dogs.

5. Just what stimuli are needed to start the mass movement of the fecal matter into the rectum is not known.

6. It would seem that the activity of arising, dressing, etc., taking of food into the stomach, and habit play a part in producing stimuli.

Before discussing the second part of this paper I wish to bring to your attention some of the results of our experiment which I have just completed. As stated above it seems that the activity of arising, or exercise, the stimulus of food taken into the stomach, and habit play a part in producing the urge for defication. Eighteen students who stated that their normal bowel movement occurred immediately after eating were used in the experiment. The purpose of the study was a try and discover what would be the effect of removing the stimulus of eating and replacing it by some other stimulus, such as, exercise, massage, rest or motoball.

The students ate nothing at the meal-time preceding the usual time of defication. The time utilized in eating was replaced by either exercise (300 running steps), massage (deep kneeding around the colon for 10 minutes), rest (10 minutes in the reclining position), or the motoball[5] (around the colon for 10 minutes).

The following table gives the results of this study:

TABLE I

Defication	*Exercise*			*Massage*			*Motoball*			*Rest*		
Time	*Times*	*Men*	*Pc.*	*Times*	*Men*	*Pc.*	*Times*	*Men*	*Pc.*	*Times*	*Men*	*Pc.*
Same	18	2	15.8	41	3	43.6	23	5	31.5	15	4	51.8
Retarded	55	8	48.3	43	7	45.7	26	2	35.6	12	4	41.4
Hastened	28	6	24.5	8	6	8.6	17	6	23.4	0	0	0
No Movement.	13	1	11.4	2	1	2.1	7	2	9.5	2	1	6.8
	114	17	100	94	17	100	73	15	100	29	9	100

It is difficult to form any definite conclusions from these figures but it is evident that no method tried was as good a stimulus as eating. In fact, it seems that in most cases any mechanical means tried in this experiment retarded the normal time of defication. It must be kept in mind that these cases represent individuals who have a normal bowel movement and not persons suffering from constipation.

The problem which is of chief interest to us is how we can help those persons, who for some reason fail to have a normal bowel evacuation.

For many years the term auto-intoxication was used to describe those symptoms which were said to occur in constipated individuals; i.e.: headache, malaise, dopiness, mental haziness, etc. It was Alvarez who expressed the belief that the symptoms of the so-called auto-intoxication, described by constipated individuals, were due to a mechanical disturbance of the lower colon by the fecal matter. He was able to produce these symptoms at will by stuffing cotton in the rectum.[6]

The publication of these facts did much to relieve the auto-intoxication phobia. Some time later Ivy investigated the effects of the prolonged presence of a mass in the rectum. He used 21 medical students and inserted a balloon into the lower colon through a proctoscope and filled the balloon with water. This acted mechanically like a mass of fecal matter. He was unable to discover any symptoms characteristic of the so-called auto-intoxication syndrome even in those who carried the balloon for a long time. He found it produced a painful urge to deficate which was due to the steep contractions in the colon. There were, however, no symptoms of headache, dopiness, etc. Constipated patients who used cathartics did not complain of a painful sensation while the balloon was in the colon, yet they showed infrequent steep contractions. It seems to Dr. Ivy to indicate that the threshold sensation in the constipated person is raised. It has been definitely shown by Hurst and others that the lower colon is at fault in the majority of cases.

The *causes* of constipation are numerous and varied. Bodily inactivity, old age, frequent pregnancies, obesity, constant straining at stool, faulty posture, improper dress, weak abdominal and pelvic muscle strength, improper foods and many other items have been given as causes of this condition. A search for the cause is a prerequisite to any treatment.

Soper states that the majority of cases of constipation usually fall under one of the following types:[7]

1. About 50 per cent of constipated individuals are usually in that condition because of the habitual use of cathartics and enemas. They usually possess the normal mechanism for the production of colonic function but through neglect and abuse the mechanism has ceased to function.

2. The spastic form usually occurs in the worst type of individual. On palpating the abdomen the descending colon is usually contracted down to a hard "cord" which is sensitive to pressure. The fecas consists of small hard marble-like balls. It is said by some that this type is due to an unstable nervous system. Due to the in-

[4]Bastedo, W. A., Jour. Mich. State Med. Soc., July, 1930.

[5]The motoball is an apparatus consisting of three balls, the size of a baseball, which are rotated by a motor around the colon. They may be adjusted to produce a deep, regular kneeding of the underlying organs.

[6]Alvarez, W. C., Intestinal Auto-Intoxication, Phy. Rev. 4:352:1924.

[7]Soper, H. M., Med. Herald and Physioth., July, 1929.

creased intra-abdominal pressure necessary to overcome the spasm of the sphincters, hemorrhoids and anal fissures are most frequent in this form of constipation.

3. The atonic form occurs in the asthenic type of person. Palpation discloses an abdomen relaxed and soft.

Treatment. The problem which now arises is how we, as physical therapists, can best help those individuals suffering from constipation. We must presuppose that the patients have been thoroughly examined by a physician and he has advised some form of physical therapy as the best means of treatment. The next question which must be decided is the best form of treatment to be instituted. The methods which we have at our command are, massage, exercise, motoball, colonic irrigation and electrical stimulation.

Massage. As one studies the literature on the effects of massage in moving the fecal mass and producing a bowel movement, it becomes evident that there is no unanimity of opinion. Gant in his book states that "Massage systematically and persistently given constitutes one of the most valuable of all the physiologic therapeutic procedures which have thus far been suggested for the relief and care of constipation and allied conditions,"[8] Hurst states, "Whenever constipation is due to want of activity of the intestinal musculature, the condition of the latter may be improved by abdominal massage, which exerts a directly stimulating action on it."[9]

If massage does aid in constipation, the precise method of action seems to be in doubt. The commonly accepted theory, that as one massages from right to left along the course of the colon the fecal matter is pushed along, is attacked by many investigators. Soper states that abdominal or colonic massage is absurd, "Who has the presumption to state at what time the intestinal contents should move forward? It is our duty to attempt restoration of normal rhythm instead of using methods that tend toward further disorganization."

Bastedo reports that it is difficult to move fecas along with the abdomen open. Alvarez noted under the fluroscope that even in thin persons the fecal matter in the left colon was held so firmly that he was unable to push it at all and he thinks massage is of little value.

Rosenthal in 1910, after reviewing the physiologic effects of massage, believes that its prime function is in increasing the blood flow to the parts massaged. This opinion is likewise adhered to by Cajore, Crouter and Pemberton.[10]

From many x-ray investigations Case states that "abdominal massage therefore does not result in a true passive stool, but is only a mechanical stimulant for the circulation of the blood in the intestine and its mesentery, and acts through the beneficial effect upon the tonus of the bowel wall."[11]

Summary. It would seem that massage of the abdomen is of doubtful value as a means of mechanically pushing the fecal mass along the colon. Whatever value is derived from massage seems to come through increasing the muscle tone or the blood supply to the part. Mennell summarizes his opinion of massage as follows, "Considering the variety of the causes of constipation it is no matter for surprise if in the absence of information as to the cause, treatment should fail, or even, it may be, inflict injury." He recommends massage only in certain cases and as an adjunct to other treatment.[12]

Exercise. The literature on the effect of exercise on bowel movement is limited. Dr. Arthur Steinhaus, in his studies in the Physiology of Exercise, has completed some interesting investigations in this field. In a recent article on *The Modification of Colonic Motility Induced by Exercise and Some Indications for a Nervous Mechanism,* he reviews the literature and reports the results of his experiments on dogs.[13]

In *A Treatise of the Science of Muscular Action* (1794) John Purch, a London anatomist, quotes unnamed earlier writers as saying, "Exercise helps to throw down wind from the bowels and attenuates the contents of the stomach." "Exercise also serves at once as an evacuant, and a diversion by which artifices the humors are put into condition of flying off without danger of bringing on spasms." When one reviews the etiological factors of constipation, as stated in most medical literature, the terms "lack of exercise" and "sedentary life" are usually mentioned. As Dr. Steinhaus states: "Some writers see in a strengthened abdominal musculature the facilitation of defication while others attribute the beneficial effects of exercise to the massaging action of the exercise movements."

It is quite universally recognized that mass movements of the colon may be brought on by eating, accompanied by the urge for defication. Dr. Steinhaus found that during an exercise period, in dogs running on a treadmill and studied by the balloon method, there is in a majority of cases a marked rise in colonic tone and motility. He believes that this rise observed by him and others, which is often accompanied by defication, is in nature very similar to those mass movements observed in man.

Referring to the experiment which I conducted it would seem that the stimulus of exercise is not as good as the stimulus produced by eating as shown by the figures in Table I. In that experiment 15.8% of the students found exercise produced the same stimulus for defication as eating, 48.3% were retarded, 24.5% were hastened, while 11.4% had no bowel movement.

The relationship between bowel activity, especially in the so-called constipated individual, and exercise is a subject upon which further investigation is needed.

Colon Irrigation. The relation between colon irrigation and constipation is worthy of discussion. For many years this form of therapy has been used as a cure for many forms of bowel conditions. In the discussion of this subject I am quoting from the article on Colon Irrigation by Dr. Walter A. Bastedo, published in the Handbook of Physical Therapy. As these statements have been accepted by the Council on Physical Therapy we must assume that they are correct. "Between enemas and irrigations there seems to be no sharp dividing line, yet they are distinct in their purposes." An enema is used for the purpose of inducing defication while an irrigation presupposes the fecal matter in the lower bowel has been removed. The colon irrigation is given "to wash out material situated above the defication area and to lavage the wall of the bowel as high as the water can be made to reach. It has been demonstrated that the so-called "high irrigation" is a misleading term for "with a tube 3 inches long and a pressure level of 2 feet, the liquid will reach the cecum in from 2 to 5 minutes."

It would seem advisable, therefore, to keep in mind the fact that an enema is a form of treatment for constipation and that colon irrigation is a form of treatment which is used to wash out the contents above the normal defication area. The conditions in which colon irrigation seems to be indicated are mucous colitis, putrifaction and focal infection. One must keep clearly in

[8]Gant, S. G., *Constipation and Intestinal Stasis,* 1916.
[9]Hurst, *Constipation and Intestinal Disorders.*
[10]Cajori, Crouter and Pemberton, Arch. Int. Med., Vol. 39: pp. 281.
[11]Case, J. T., *Some Observances of the Cause and Treatment of Constipation.*
[12]Mennell, J. B., *Massage.* 1920, p. 403.
[13]Am. Jour. of Physiol., Vol. 99, No. 1, December, 1931.

mind, however, that "the introduction of water or other liquids into the bowel, whether as an enema or irrigation, is an abnormal procedure, and cleaning out the whole colon too frequently may harmfully interrupt its normal function."

The introduction into the colon of astringents and antiseptics is not usually recommended. It has been shown by Dragstedt and Nisbet of the Mayo Clinic, in tied off intestinal loops, that 70% alcohol, ether, strong solutions of cresol, phenol, silver nitrate, etc., failed to produce sterilization.[34] What can one expect from the weak solutions usually used in intestinal antiseptics? Hershburg states that a soap suds enema is as irritating to the mucous membrane of the bowel as it is to the conjunctiva of the eye.

Cannon Ball Massage. It was Dr. Sahli of Berne in 1887, who is given the credit for first describing the cannon ball method of abdominal massage. This form of massage was performed by rolling a cannon ball weighing from three to ten pounds covered with a flannel, along the course of the colon.[35] Numerous writers have often mentioned this method as a form of treatment in constipation. Dr. Hurst in his book states that "Auto massage is best done by a method which appears to have been suggested first by Sahli in 1887."

In his book "Treatment In General Practice," Dr. Beckman of Marquette University says, "Massage of the abdominal muscles should be practiced or its substitute, the rolling of a 6 or 8 pound ball over the abdomen, for about ten minutes each morning."

In Bulletin M-452 issued by the U. S. Public Health Service, the following statement is made: "Physicians have found that the rolling of a heavy ball over the abdomen is of service. When such a ball is used, the direction of the movement should be such that it begins at the lower right hand portion of the abdomen, is directed first upward, then across the upper portion of the abdomen to the starting point on the right."

The answers received on a questionnaire from a dozen or so leading gastro-intestinal specialists as to the value of the cannon ball in constipation was very illuminating. It is not within my power to make known their answers but I may say that a large majority of these physicians did not recommend this form of treatment.

In the experiment conducted with the motoball the figures do not show that it hastens bowel activity in the majority of students used in the study who had a normal bowel movement which seemed to be conditioned by habit and eating. (Same, 31.5%, Retarded, 35.6% Hastened 0, No Movement 9.5%.)

The clinical value of the cannon ball or motoball in cases of atonic constipation should be carefully investigated before any definite statements can be made.

To recapitulate:

1. It would seem that massage of the abdomen is of doubtful value as a means of mechanically pushing the fecal mass along the colon.

2. Exercise, in dogs, produces a marked rise in colonic tone and motility which is often accompanied by defication. It is believed that these mass movements are in nature very similar to those observed in man. The value of exercise in treating constipation is a subject upon which investigators are needed.

3. Colon irrigation is not a procedure recommended for constipation. The too frequent introduction of water into the colon is an abnormal procedure and may harmfully interrupt its normal function. The use of antiseptics and astringents are of questionable value in sterilizing the colon and may be irritating to the mucous membrane.

4. The use of the cannon ball or similar appliances to massage the abdomen is of questionable value in constipation. There is a need for further scientific investigation of this method.

5. The use of all mechanical methods is contra-indicated until recommended by a physician who has carefully examined the patient.

6. In the experiment conducted it was found that massage, exercise, rest, and the motoball were not as effective in producing a normal bowel movement in a normal individual as regular habit and eating.

Chicago, Ill.

[34] Dragstedt, C. A., and Nisbet, O. M., Intestinal Antiseptics, J. Labr. & Clin. Med. 8:190-193 (Dec.) 1922.
[35] Sahli, H., Corresp. fur Schwizer Aerzte, XVII, 581, 1887.

Comments

By Edmund Jacobson, M. D.

I scarcely know exactly where to begin or what to say after I have begun. As I came up to Milwaukee on the train I had some trouble to get myself comfortable in the seat in the day coach. Finally I decided that I might as well go to sleep. After some effort to find a place for my head, I rested it against the window with the shade pulled down. After a while to my amazement I heard the conductor call out "Waukegan!" and I dimly surmised that I must have been asleep for a half hour.

A little while later I heard somebody shouting in my face, "Pillow?" He awoke me, and more or less sleepily I reached for the pillow and was about to put it under my head when he said, "Twenty-five cents, please!" I said, "I don't get your idea, waking me up to charge me 25 cents for a pillow to go to sleep on." Either my sense of economy or my sense of humor got the better of me.

I wish to repeat that I scarcely know where to go from here. Miss Rathbone gave me the idea that I was to try to digest each paper read here, and to give my reactions, which rather places me in the class with the quadruped known as the goat.

To begin with the first, I don't suppose it is fair to make critical comments on a paper which was not read by the original writer, so I really should express myself chiefly in forms of queries. If I understood rightly, we were told that pain in some conditions of suspected gallbladder trouble and appendicitis really is pain that is referred to peripheral nerves in the abdominal wall. I should like to ask what proof there is of that view. One of the first things that would occur to us in testing such a theory would be to cut those abdominal nerves to see if that had any influence upon the pain. This might not prove to be a crucial experiment, but at least it would seem worth doing. My own experience certainly includes many cases where the individual appeared upon first glance to have symptoms coming from the appendix or from the gallbladder which later turned out to be neither appendicitis nor gall bladder disease.

There has seemed to be some evidence in some of the X-ray studies that I have made that individuals who have chronically spastic conditions of the caecum or chronically spastic conditions of the intestine adjacent to the gallbladder may have symptoms which are rather hard to distinguish from chronic appendicitis, so-called, or chronic gallbladder trouble.

It has also seemed to me to be true in my experience that if an individual has become relaxed in the intestinal muscles, those symptoms have in many instances disappeared.

Of course, I am not discussing states where there is local accumulation of pus or other states of marked inflammation in the region of the appendix or of the gallbladder, but I am discussing conditions which simulate that type.

I well remember the very first case of spastic colon that I undertook to treat by methods of relaxation. The appendix and the gallbladder were so extremely tender to the touch that one just did not dare press upon them. I therefore called in a consulting surgeon, Dr. E. Willis Andrews, who was quite noted at diagnosis as well as surgery at that time. He and his son did not believe that the condition in the appendix or gallbladder called for operation. One of them suggested that I try to relax the patient first. Six months later the tenderness in the appendix region and in the gallbladder region had disappeared. About seven years have since elapsed, and the patient has continued to be free from symptoms, although according to her history she had suffered for thirty years previous to our first examination.

These and other similar experiences leave me somewhat skeptical as to the mechanism whereby exercise might produce relief from symptoms of tenderness and pain referred locally to the region of the appendix or gallbladder.

With reference to the second paper, I feel like saying again what Dr. Deaver has said in relation to colonic therapy. Perhaps I may be permitted to amplify a bit. We are dealing in all matters of therapy of human beings with a very complex subject. I would venture to say, so long as Dr. Coulter is not here to trip me up, that we have no real science of therapy in medicine. It is at best an art, at best the beginnings of a science. I should even venture to disagree with Miss Rathbone's comment about Miss Griffin's admirable enthusism for colonic therapy. No one should be very enthusiastic over this or that method of treatment at the present day, at least with reference to colonic therapy. I question, I mean to say, whether the enthusiasm, in the absence of many years of very careful testing of the use of colonic therapy, is justified. It is true that the individual may feel better after a particular form of therapy has been used, and in our enthusiasm we may say he is well because of what we did. Meanwhile he may have gotten well through a variety of circumstances. It is the old argument of post hoc ergo hoc. That is one precaution that we need to take in our reasoning.

The second is that we make certain that only one measure of treatment is being followed during the period of study of the individual. If you are using colonic therapy, you must be certain that psychological influences are not being used, or as nearly certain as possible; you must avoid medication; you must avoid massage; you must avoid electrotherapy, not necessarily because you have doubts about those other measures, but because unless you eliminate those other measures you will be unable in the end to say to what measure the result you have obtained should be ascribed.

The third precaution that we should take in studies of therapy is, as Dr. Deaver illustrated, the use of statistical approaches. We should not be at all afraid of using mathematics. We have to use mathematics, because frequently results will be positive or negative just by chance, and a great many results will be negative because in spite of all our efforts, factors will have been brought into play which we would have preferred to keep out of the experiment.

The fourth thing that we will have to do if ever a science of physical therapy is developed is to use our heads. We must not be fearful at all of hard work. You know how many years of study are required to establish, so that we really know it, even a small point in physiology, for example. Still greater efforts are required in this more complicated field of treatment of human conditions.

I am so much impressed with these points which I am emphasizing, that I can assure you I often regret ever having undertaken to devote many years of study to treatment of human conditions.

I think we were all very greatly interested in the paper on dysmenorrhea and the influence of exercise. But we ought also, I believe, to think, in that connection as in any other, of all the objections that might be raised. When the individual who has dysmenorrhea is home from her schooling and gets relief from dysmenorrhea, are we to assume that she exercises less on her vacation than she has exercised in college, or that she is more distracted at home by the many social amusements that she has during her vacation? Possible psychological effects must be considered. If you tell a person with dysmenorrhea to exercise and you get a favorable result, to what shall you ascribe the result? Perhaps to the expectation that she is going to get some benefit, because you are making that suggestion. Again to what extent shall we ascribe the favorable result to the distraction of exercising in place of lying down?

There are two kinds of rest, roughly speaking. One is the kind of rest in which relaxation is not complete. If you are not experienced at observing states of rest, any individual lying down may appear to you quite relaxed, quite at rest; nevertheless, if you were to test that state with a sufficiently delicate recording instrument you might find that many such a person is not at all completely relaxed.

So far as I know, during the state of almost but not complete relaxation, pain can be very marked. Moderate or incomplete rest, then, if we call it by that name, would not necessarily prevent pain from the uterus during conditions of dysmenorrhea.

We leave untouched the question whether or not complete rest, when the muscles of the skeletal system are completely relaxed, tends to diminish pain sensations from the region of the uterus. In my studies we have a few preliminary suggestions or indications that in complete relaxation there is diminished pain sensation from the uterus. But, to repeat, during ordinary rest the uterus may be quite painful during dysmenorrhea, more painful than if you distract that person by perhaps having him be up and about and exercising or attending to social functions. We all know from experience that in the presence of a moderate amount of pain we can get more relief by attending to some interesting business than we can if we just lie down in ordinary rest. So perhaps similar distraction is all you do when you tell your individual to exercise for dysmenorrhea.

Those questions will have to be reinvestigated, it seems to me; they will have to be carried very much further and in a critical spirit before we can say that we know anything definite about them and that we are not just guess-

ing in the way that the General Electric Company, for example, was guessing before this visit which Dr. Deaver tells us Dr. Carlson made.

Dr. Deaver suggested that I say something about muscle tone, and I presume that what he wished me to speak upon was not so much an academic definition of muscle tone as something to enable us to know what persons mean when they say "muscle tone." In physiology, as you know, the word "tonus" some thirty-five years or more ago was defined as a state of slight contraction present in all healthy muscle, which prepared that muscle for its appropriate activities. The belief was that if the muscle were quite zero in activity it would not be ready to function—at least it would not be quite so ready to function as if a slight degree of chronic contraction were present.

That view persisted until about 1915, when Sherrington defined tonus in terms of posture, which, of course, should be of interest to you all. The definition of tonus in terms of posture is still the current definition in physiology, although I don't believe it is altogether correct.

Sherrington pointed out that in his cats from which the brain had been removed, causing a condition of rigidity,—"decerebrate rigidity," not all the muscles were in a high state of contraction. The location of tonus largely depended upon the posture which the cat assumed. In order to assume particular postures, certain muscles had to go down to zero muscular activity, while other muscles had to contract. He therefore proposed the term "postural tonus" to mean a state of activity of certain muscles required for a particular posture, while other muscles remained quite inactive.

The next development of the subject of muscle tone came from the laboratory at Cambridge where Adrian, working with a fairly sensitive electrical apparatus, showed that during a state of tone of any particular muscle it is always possible to demonstrate that electrical currents are produced by individual muscle fibers of a constant voltage magnitude. At this point I should say that since 1842 we have known in physiology that whenever a muscle contracts a wave of electricity is given off; that is, if you connect a galvanometer to fibers in that muscle, you will be able to detect, if your apparatus is sufficiently sensitive, a flow of electrical current along the muscle fiber. That was so important a point that it played a great part in the early history of the development of electricity.

In 1907, a German investigator, Peiper, first studied electrical changes in muscles of human beings during their contraction; that is, he studied the great big movements which are so easily apparent to the eye.

Adrian, then, made his studies upon cats and dogs in order to determine whether or not electrical changes take place in persistent conditions called tonic muscular contractions in mammals.

My own studies have been concerned with human beings also, and I have been able to detect in human skeletal muscles the presence of electrical currents during tonic contractions, however slight. Adrian's original apparatus was not sufficiently sensitive to study the slight contractions often present when persons are "nervous." It requires an apparatus at least ten times as sensitive as Adrian's apparatus. You must measure down to one-millionth of a volt in order to be able to state whether or not a human muscle is slightly in contraction.

Having wandered apparently all about the point I will come back to Dr. Deaver's question. We can now state, I believe, that by muscle contraction or muscle tonus we mean the state of a muscle in which we are able to detect with a suitable and sufficiently delicate electrical recording device, the presence of electrical currents or electrical differences called action potentials.

It would be fair to say that tonus lies at some point or points between zero and 100. If you have your galvanometer before you, you can see this very definitely. It is not nearly so complex to see as it is to hear about it. Just imagine that one were describing radio; you can readily see how complex one's discussion would be, but it isn't at all hard to listen to a radio report. At any rate, during relaxation your galvanometer string is steady; during contraction or the condition you describe as tetanus your string will vibrate violently, and during the condition of tonus your string will vibrate moderately and fairly constantly. You can definitely discriminate between the various conditions, and quantitatively. It has now become an utterly precise method of study.

On the other hand, there is a second use of the term "muscle tone" which is frequent among physical therapists, which means something entirely different. I may have a muscle which is quite relaxed, that is, it gives forth no action potentials at all, no electrical potential differences, but it is a healthy muscle, it is perhaps a well developed muscle, it is capable of acting properly, and in the sense of the physical therapist, I might say that muscle has good tone. Good tone in that sense merely means that when the muscle is in action it behaves normally; you can palpate it and it feels firm and it does its job well. Good tone in that sense is a clinical term and not a physiological term. The two terms frequently get confused, because relaxation (in the sense that I am interested in) is quite compatible with "good tone" in muscles; in fact, so far as I know, it contributes toward "good tone" in muscles. At the same time, relaxation in the sense that I am interested in does away with muscle tonus for the time being to the zero point.

I am going to say just a few words about the one topic I was supposed to speak about. In the matter of the application of methods of complete muscular relaxation to abdominal conditions, it has proved painfully necessary to observe the precautions which I have attempted to emphasize as being applicable to other departments in physical therapy. We have to resist the temptation to draw conclusions quickly, and that is why I suppose I am still at this same story after twenty-two or twenty-three years of work.

The evidence that I have managed to accumulate bearing upon the relation of skeletal muscle action to abdominal conditions is really very meager. I have scarcely time to tell you in detail as to what the character of that evidence has been, but perhaps I can say a few words about the various types of such evidence.

First of all, I presume that there is someone here who doesn't know what I am talking about when I mention relaxation, since I have already indicated that I do not necessarily mean the condition that everyone achieves when he just lies down. I mean the condition when he lies down and most of his skeletal muscles, including those of eyes and of speech, proceed to the point of zero contraction; and, as I have said, whether he reaches the end point has to be determined by various methods, including the most precise one that I have outlined, namely, electrical measurement.

An individual is taught to relax precisely as he is taught how to drive an automobile or how to speak French. He is given periods of instruction, perhaps twice a week, and he practices by himself on other days. He does not progress, I believe, through belief in his own progress, because I have seen many a person who

thought he was doing very well and who I didn't think was doing at all well, and on whom objective tests verified that he was not doing at all well. A person learning to relax, proceeds, so far as I have been able to determine, precisely as anybody proceeds who learns any other physical art.

When an individual comes with symptoms of abdominal pain or of constipation and is taught to relax, the treatment ordinarily requires months or a year, particularly for conditions of mucous colitis or spastic colon. If the individual learns to relax as tested objectively by electrical or other methods, he is likely to tell you that his symptoms are all gone long before you agree with him that the spastic condition has subsided. I need not say that one needs to be very careful to avoid telling the individual he is going to get well or that he will get improvement. A certain measure of belief in that effect may be inevitable, but so far as the physician can, he tries to avoid contributing to that belief.

As the individual learns to relax, then, if you follow his colon with x-rays every few months, there occurs in favorable cases a diminution of the spasticity of the colon as determined under the x-ray. But, as a rule, his colon is still spastic when he says his symptoms are gone, and it takes many months thereafter before you get a well relaxed colon. Needless to say, success is no more attained in 100 per cent of the cases in this line of therapy than in any other line of therapy.

A second means of studying spastic cases is through studies of the esophagus. You give a spoonful of a certain type of barium paste, and with that same stop-watch which tells me I am talking too long you determine the length of time that a swallow of barium paste takes to pass into the stomach. In a normal individual, so far as I have determined with preliminary tests on about 100 medical students, a single swallow goes down in under a minute. In a person suffering from a spastic condition,—even a person who is symptom-free,—that single swallow similarly timed may take five, ten, fifteen minutes, or even an hour, to pass down into the stomach. During these prolonged periods the patients may say that they still feel it. The paste used is fairly thick and is likely to stick if the esophagus walls do not naturally relax.

I think those two measures that I have outlined will indicate to you the type of evidence that I have so far been attempting to collect in order to test the view that patients with spastic colitis and mucous colitis and pseudo-appendicitis and pseudo-gallbladder trouble are really improved through the relaxation when they say they are improved through it, and when they appear to be clinically well. We cannot take their word for it even at that, nor can we take the word of the enthusiastic physician. Rather we have to study the whole subject very carefully and critically, and we shall be very fortunate at the end of another ten years of study if we are able to say that the splendid clinical results that we have been observing in constipation and in painful abdominal conditions, such as mucous colitis and spastic colon and pseudo-appendicitis and pseudo-cholecystitis, are really due to the measures of teaching relaxation.

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MISS RATHBONE: It seems to me that a great many questions have been answered and this address does not leave many to be asked. Are there any questions?

DR. DEAVER: Dr. Jacobson, could you assume for us the position which you say is the best one in which to read, approximately?

DR. JACOBSON: Yes, I will try it. Of course, you are not referring to the matter of light being over the left shoulder, and all that sort of thing. Doubtless, that is important and prerequisite. In working on the matter of reading with patients, for example, in dealing with a nervous patient, or even with some student or professor who finds that he is wearing himself out in his work, we will assume that he has come to this stage of learning to read in a relaxed fashion after he has already been shown how to relax all his muscles lying down, and that he regularly goes to sleep in that position; that he also has had a complete review of the chief muscle-groups sitting up, and is able to relax his muscles completely sitting up, along with those of the eyes.

If I relax before you, which of course is something of a stunt since you are all here and stimulating me, I let my arms go a little, let my legs go a little, I feel considerable tension there. My voice is already dropping and not carrying very well. I let go my forehead next. I shall have to stop talking. Only the last minute before I begin to talk again will illustrate a fair degree of relaxation. * * * * *

I always fear that some persons in an audience may get the notion that in spite of all the experimental work one attempts to do on a subject like relaxation, there is something of a fad in it. All I can say is that if there is we are at any rate attempting our best to eliminate it. I think there is no element of fad in it whatsoever.

After an individual has learned to relax to that extent, he is given a book and instructed to relax the eyes again until the words blur. That, of course, is a very simple thing to do. He then is requested to relax generally, that is the arms, the legs and the trunk, just to the point where he sees the words and reads the words but doesn't get the meaning, and then to report what happens. A third thing that he does is to read and get the meaning and to report what happens. He ordinarily should report a series of eye tensions and tongue or lip tensions as he reads.

In the matter of reading, of course, he simply should apply the principles of differential relaxation. He needs to use those muscles which are required for the task, but other muscles should be relaxed. Therefore, as he reads he should relax his leg muscles unless they are sufficiently relaxed at the outset; he should relax them practically to the zero point. He should relax the muscles of the back just up to the point where he would fall over if he didn't maintain a little element of tension there. He should relax the muscles of the chest. He should relax his forehead, his brow, and that instruction applies particularly to individuals who come with very many worries and distractions. Very commonly you find that their foreheads and brows are quite tense. His ultimate posture, then, is one of differential relaxation; that is, certain muscles are required for the task of holding the paper, namely, some of the muscles of the arms need to be slightly tense in order to hold the paper properly, but the arms should not be very tense. The neck should be slightly tense in order to hold the head in proper reading posture, but there should be no excess tension in the neck muscles. The eyes should be sufficiently tense to read the words, and perhaps he may want to read very quickly. The eye tensions are primary tensions; they are needed for the task. We distinguish between primary tensions, those needed for the task, and secondary tensions, those which have nothing to do with it. Secondary tensions ought to be relaxed completely, and primary tensions should be relaxed to the point where no excess is present.

His eyes, then, may move very quickly; his tongue and lips are likely to be slightly tense, but you could

not see that; it would require a delicate recording instrument to discover that. His ultimate posture or appearance might be something like this. (Illustrating.)

But a variety of other positions might be assumed. In general the arms might, if he choose, be held up, but you are using energy unnecessarily in that position. The arms might be supported; the legs might be up. If an individual assumes too relaxed a position he is likely to find that the reading suffers, the primary tensions become too diminished for efficient work.

DR. DEAVER: How are we, then, as physical educators and physical therapists, to teach children the best way in which to read, for maximum efficiency. Are we justified in teaching them to sit up straight? What good is good posture in so far as it is taught in school or in health education? You see children sitting at the desk erect.

DR. JACOBSON: I heard you say so many interesting things at the luncheon table on posture that I think you ought to continue the talk.

DR. DEAVER: I am trying to prove something for myself. I am trying to find out if posture instruction as taught at the present time to school children, is all wrong from the standpoint of the methods which you are teaching for maximum efficiency—relaxation of those muscles which are not needed for the task.

DR. JACOBSON: I think I should agree with everything you said at the luncheon table. Doubtless a great many persons here would be interested in hearing what you said.

DR. DEAVER: You have not answered my question.

DR. JACOBSON: I should simply say that good posture is a relative term. If what you are after is physical beauty, then persons who are interested in esthetics might tell you that a certain erect position of the back makes the best type of painting or looks most graceful. Such an erect position of the back would cost a little energy. That energy would be nervous energy and muscular energy. It might be worthwhile, just as sometimes good clothes are worth the money spent for them. It is not the most efficient thing to maintain an erect posture; it is a costly thing. Whether you want to do it or not depends upon whether your point of view is esthetics or efficiency. I only know that if I am dealing with a patient who has a bad heart and whose energy I wish to save by teaching him to be relaxed, and if in addition that person is nervous, I tell him to forget good posture. If he then complains that his friends don't think he looks quite so handsome as he used to, I say, "Well, that is the cost you will have to pay for conducting yourself with the least expenditure of nervous and muscular energy."

DR. DEAVER: I am glad to hear that. I have come to the conclusion from my studies that the only justification for posture is esthetics and it has no relation to health. That is my finding. That may be a shock to some of you who are in physical education and physical therapy who are dealing with children all the time and trying to get them to stand up straight and are giving them exercises when perhaps rest in bed and a glass of milk would answer the purpose.

According to the experiments done at Mellon Institute in Pittsburgh, the most restful sleep is one in which there is the most movement; that is, if a person says that he sleeps like a log, he wakes up tired in the morning. That is based upon the fact that with stasis the blood doesn't get through the capillaries in the skin; as you move, the blood goes through. Would you say, then, that complete relaxation for sleep was not as good as a certain amount of muscle tonus so that the person moves about?

DR. JACOBSON: No, I wouldn't. The experiments at the Institute so far as I know were conducted, at least in the first instance, with lights thrown on the eyes, and I know that I should be very restless if anybody threw a light on my eyes or threw light anywhere in my vicinity to test the restfulness of my sleep. I don't believe those experiments were conducted under normal conditions.

DR. DEAVER: Weren't the second experiments done with attachments to the bedsprings that registered the movements?

DR. JACOBSON: Yes. Those were better experiments, but they still simply show us this: that under the conditions of those special tests those particular individuals were pretty restless. Now we can assume, either from those experiments or from our own knowledge, that an individual commonly does a bit of tossing about at night. On the other hand, I have often observed in individuals who have been trained to relax that they do not move restlessly like that. I have been watching them for ten or twenty years lie quietly for a whole hour, and perhaps they were quite deceived, but at the end of that hour they arose and said that they were refreshed, and very much so, somewhat more refreshed, they believed—it was only their subjective opinion, of course—than perhaps from an hour of ordinary sleep. I am inclined to believe, then, that the most restful sleep is a sleep free from these movements.

Perhaps it is true that circulation is not quite so good under those conditions, but it isn't needed, either. The various organs are not called upon for any marked activity. You yourself said the kidneys are not functioning quite so actively as during exercise. The individual has quite time enough to make up for that lack of motion when he gets up again. I believe, then, that the restlessness observed in those individuals was the restlessness that is observed in partially tense individuals.

MISS BRASK: I should like to ask Dr. Deaver one question. I am curious about these abdominal exercises. Whenever we give those movements of the legs on the trunk it does bring abdominal muscles into play. Wouldn't you call that an abdominal exercise?

DR. DEAVER: You don't use your abdominal muscles when you raise your legs. I don't say because you raise your legs there is no connection between the muscles in your legs and the muscles in your abdomen.

MISS BRASK: Can you not call it abdominal exercise in that case?

DR. DEAVER: No, because you are not using your abdominal muscles to lift the legs; that is secondary. If I were going to do it, the first thing I would do would be the opposite; I would have the individual lie down and flex the legs in order to relax the psoas and iliacus. Then any movement you do with the torso, any twisting, would get the rectus working. But you don't have that tremendous strain on the individual as you raise the leg. It is an awfully hard exercise for people to do. I have seen people sit on a chair and hook their feet on the rounds and go all the way back and say they were doing an abdominal exercise. They are simply stretching those muscles apart; they have a hemorrhage into the tissue, and naturally they are sore. They have injured the muscle tissue. One has to be very careful in prescribing exercises. and must know what the action of each muscle is in contraction and relaxation. Kinesiology is a very, very deep subject. All I ask is, please don't say that raising the leg is an abdominal exercise.

MRS. NYLANDER: I would like to make one re-

mark about a statement made by Dr. Jacobson that it requires less energy to stand in a non-erect position than it does in the commonly accepted good posture. That is contrary to something that I have heard somewhere in my studies, that mechanically it requires less energy to stand in good posture than in a relaxed position.

DR. JACOBSON: I think I am guilty of making the remark that is being called into question. Frankly speaking, I don't believe, if I have to be brutally frank, that they have had the facilities to test the point—I don't know whom you are quoting. It is a complicated problem. If they made the statement that you have made, there would be only one adequate way for them to really test the point. I haven't done that either, so put mine down as surmise, if you choose. It would be necessary, in order to test this point of energy expenditure, first to train a set of individuals to relax or to make certain that they naturally relax, that is by natural measures of muscle tonus; second, at the end of that period of time to take the erect posture and the relaxed posture for a given period and test by direct or indirect calorimetry, simultaneously taking action potentials. That would be the only way really to study adequately the question of energy expenditure during posture. Until we have done that our statements are more or less conjectural. I doubt that this is going to be done in the next year or two because of the complexity of the topic and because the apparatus required is extremely delicate and very, very costly.

At least the prima facie appearance of things would indicate that most obviously in a relaxed posture all or at least most muscles are relaxed, or not working, and are flabby to palpation; and that in an erect posture certain muscles are active along with apparently at least an equal amount of contraction in the other muscles that were active during the relaxed posture. It is almost obvious on the face of it that a greater degree of contraction is required in normal individuals,—that is in persons with a fairly normal bony structure, for an erect posture than for a relaxed posture.

MISS WORTHINGHAM: Is it possible that a decrease in energy might come in time with a poor posture, because of the strain of position and weight?

DR. JACOBSON: The question is raised, whether poor posture might develop with it a decrease in energy as time went on. I should like to suggest that if we are going to discuss the term posture, we must not use the terms "poor" and "good" for the time being, because that is exactly what Dr. Deaver has called into question, whether erect posture is really good posture and whether a slouching posture cannot equally well be called a good posture. It depends, then, upon what kind of posture you are speaking of. There is no reason that occurs to me at present why a slouching or relaxed posture in a fairly normal individual should result in any diminution of energy. If you are talking about conditions of arthritis such as interest a Boston school of orthopedics, there is another topic again, and one on which I do not believe sufficient evidence has been brought in to justify any conclusion, because of the failure to adhere to those precautions which I emphasized at first. So I would say that I don't think anybody has brought any evidence that relaxed posture or the postures Dr. Deaver spoke about result cumulatively in any diminution of the individual's energy, unless it be that the individual might be criticized by his friends for his appearance until he got depressed about it.

MISS BRASK: Would not an increase in lordosis with decrease in the tonicity of the abdominal muscles make it less easy for the abdominal organs to maintain their good position?

DR. JACOBSON: Dr. Coulter is here now, and he can answer that.

DR. COULTER: I have read some of Carnett's work, and I think Carnett has proven that. I think you know as much about it as I do.

MISS BRASK: That is just one example of poor posture, and if that makes the organs work with difficulty in any respect, then it is proof that good posture is desirable.

CHAIRMAN RATHBONE: I think the question should be, what is good posture? That is one question that a great many people are willing to pass judgment on incorrectly. Perhaps there is no "poor" posture and no "good" posture. That is one question on which Dr. Deaver may give us light. If five years hence Dr. Deaver finds some other evidence, I know he will drop quickly his present line of reasoning. He is always looking for evidence, and never holds a preconceived notion or a past opinion which will not stand up to modern evidence. We should all be willing to do the same thing. I am so glad that Dr. Deaver has stimulated this discussion, and I am equally glad that Dr. Jacobson has emphasized what he has, to point the way for us. We are likely, in our thinking, to remain on the basis which we came to when we were students, in the hands, may I say, of people whom we admired and adored very much. Perhaps those teachers have changed their opinions while we have failed to grow. We must go on with our self-education; and self-education will lead us to people who are thinking in many channels and are combining their evidence from a great many fields of knowledge.

If there is no other discussion we will draw the afternoon to a close and thank Dr. Deaver and Dr. Jacobson particularly for their contribution.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912,

Of The Physiotherapy Review, published bi-monthly at Mount Morris, Illinois, for October 1, 1932.

State of New Jersey } ss.
County of Essex }

Before me, a notary public, in and for the State and county aforesaid, personally appeared Dorothea M. Beck, who, having been duly sworn according to law, deposes and says that she is the editor of the Physiotherapy Review, and that the following is, to the best of her knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, The American Physiotherapy Association, Chicago, Illinois; Editor, Dorothea M. Beck, Montclair, N. J.; Managing Editor, Dorothea M. Beck, Montclair, N. J.; Business Manager, Gertrude Beard, Chicago, Ill.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.) The American Physiotherapy Association, Chicago, Ill.; President, Margaret S. Campbell, Chicago, Ill.; Treasurer, Mabel Holton, Ann Arbor, Mich.; Secretary, Lillian Beckman, Chicago, Ill.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

DOROTHEA M. BECK, Editor.

Sworn to and subscribed before me this First day of October, 1932.

ERLAND M. NELSON.

My commission expires April 8, 1937.

Abstracts

By John S. Coulter, M. D.

Physical Characteristics of High Frequency Current. Allan Hemingway, Ph.D., and W. K. Stenstrom, Ph.D., Assistant Professor of Physiologic Chemistry and Associate Professor of Biophysics, Respectively, University of Minnesota, Minneapolis, in Jour. A. M. A., 98:17: 1446, April 23, 1932.

This article considers the following:

PHYSICAL THEORY

Nature and characteristics of the electric current. Laws governing flow of currents: (a) Ohm's law. (b) Joule's law. Direct current. Alternating current: (a) frequency; (b) capacity; (c) inductance; (d) impedance; (e) impedance of resistance and capacity in parallel; (f) the effect of inductance and capacity on the frequency of an oscillating circuit. Methods of producing alternating current: (a) the spark gap diathermy machine; (b) the vacuum tube oscillator.

CONDUCTION THROUGH SOLUTIONS AND TISSUES

Mechanism of electrolytic conduction. Polarization. Stimulation and frequency; Nernst's law. Conduction of High Frequency currents through tissues.

APPLICATION OF PHYSICAL AND CHEMICAL THEORY

Diathermy. Surgical application: electrodesiccation (or fulguration); electrocoagulation; electric cutting current.

Is the current registered by the diathermy ammeter the true cutting current?

Diathermy voltage. Efficiency of a diathermy machine. Measurement of heat imparted to the patient in diathermy. Distribution of heat in diathermy. Skin effects. Requirements of a diathermy machine for clinical use.

SHORT WAVE THERAPY (RADIOTHERMY)

Methods. Clinical use. Diathermy versus short wave therapy.

Facial Paralysis. Percival Pickerill, C.B.E., M.S., F.R.A.C.S., Sydney, in Med. J. Australia, 1:13:433, March 26, 1932.

I have made several communications on the subject of facial paralysis to this and other journals in the past, particularly with reference to the treatment of the condition by temporal and masseter muscle grafts. The general impression, however, as far as I can gather, seems to be that too much is claimed for the method. It has never been claimed that the grafting of these muscles into the orbicular muscles of the eye and mouth, gives a perfectly controllable face, but the improvement when the operation is successfully performed, is very considerable indeed. Far better results are obtained than by any other method, and I have yet to see the patient who regretted having the operation done.

The advantages claimed are: (1) that the face as a whole is stabilized to a considerable extent, having two tonic muscles at least on the paralysed side to oppose those on the normal side; (2) that the patient is given the power of closing the eye on the paralyzed side. This is absolutely definite, and the serious risk of corneal ulceration and conjunctivitis is eliminated.

With regard to after-treatment, gentle massage and electrical stimulation of the muscle grafts is necessary for some months, and should be commenced three or four weeks after healing of the operation wounds. Only soft diet should be allowed at first, and for one month the patient should be instructed to masticate slowly on the normal side. Thereafter gentle voluntary contraction exercises of the masseter and temporal muscles should be ordered, increasing in frequency and intensity. It seems to take from six to twelve months for the patient to acquire full control of the muscle grafts.

The method too has another advantage which I have not previously noted and which accrues to the patient after treatment is completed. It is the improvement in psychic condition and feeling of self-assurance for business and social undertakings. This I have not had the opportunity to observe myself, but it has been noted by others and reported to me.

The Management of Posture in Children. By Reginald H. Wiggins, M.D., C.M., Victoria, B. C., in Canadian Medical Association Journal, XXVII:1:47, July, 1932.

Posture or body mechanics, has been defined by the sub-committee of the recent White House Conference on Child hygiene as "The mechanical correlation of the various systems of the body with special reference to the skeletal muscular, neurological and visceral systems." Normal body mechanics obtains when this mechanical correlation is most favorable to the function of these systems.

PREVENTIVE MEASURES

Measures.—(1) Inculcation of "posture mindedness"; (2) afternoon rest periods; (3) the child to be for the greater part of the time on its abdomen; (4) adequate support when being lifted and carried; (5) proper springs and mattresses; (6) sufficient vitamines; (7) clothing adequate for warmth but not restricting free movement; (8) development not to be forced, particularly in the presence of rickets, debilitating conditions, or after acute illness; (9) avoidance of sedentary habits and prolonged sitting positions.

2. Afternoon rest-periods are most essential in any preventive measures, as it is when the child is tired or exhausted that the muscular supporting structure is weakened, thus leading to the assumption of incorrect attitudes which have a tendency to increase and persist.

3. We are indebted to Merrill, of Philadelphia, for this rule—that the infant, after one month of age, unless in a definitely weakened state, should lie for the greater part of the time on his abdomen, particularly during his waking hours. Then the back, abdominal, and buttock muscles, those most important in maintaining correct posture, will be continually exercised.

5. The mattress and springs of the bed require attention. The mattress should be fairly firm, the springs taut and of good quality; both must allow no sag in the center.

ACTIVE CORRECTION

1. General measures.—A thorough examination of the child must be carried out and due regard given to the correction of any detective environmental influences, including the attitude and temperament of those who care for the child, also attention to the diet and any faulty eating and sleeping habits and details of personal hygiene.

2. Rest periods in prescribed positions.—Two examples will be given. Others may be devised by the physician as the occasion demands. (a) With flat chest, drooping shoulders and round back, have the child lie on his back on a small firm pillow extending from the shoulders to the lower border of the ribs and rest in this position for half an hour. (b) In the event of lumbar lordosis being present, and if retro-peritoneal fat is lacking, have the child lie prone on a firm pillow extending from the shoulders to the hips and rest in this position for the usual period of at least half an hour.

3. Prescribed exercises.—The key note in any postural exercises is relaxation. A body which is in a relaxed state mentally and physically more readily responds to the training of new motor co-ordination.

Lying on the back:

(a) Abdominal retraction.—On the count of "one" have the child retract the abdomen and tip the pelvis upward. Hold for a few seconds, then relax and repeat ten times.

(b) Hip flexion.—Arms under head; keeping feet together; flex knees, then thigh on abdomen; on the count of "one" slowly extend on "two." Repeat ten times.

(c) Arm circumduction.—This is combined with deep breathing. With the arms to the side raise up and back until they touch the floor, inhaling the while. Return them to the original position, slowly exhaling. Repeat ten times.

(d) Leg flexion.—Keeping the abdomen retracted and the pelvis tilted upward, with the feet together and the hands under the head: Slowly raise the legs alternately five times to a right angle with the body and slowly lower. Repeat an equal number of times with both legs.

Lying Prone:

(a) With the feet held down, a pillow under the abdomen, the hands behind the head, and the feet together, slowly raise the head and shoulders as far as possible and slowly lower. Repeat ten times.

(b) Back abdominal.—A similar exercise, only performed lying over the edge of a table or bed, with the edge of the table or bed at the pelvis. The feet should be together and firmly held to the table by an attendant, with the hands behind the head and the abdomen retracted, and the head held on a line with the body.

Standing:

Stand erect with toes turned slightly in and the feet about 6 inches apart.

(a) With the pelvis tilted upward, the abdomen slightly retracted, and holding the knees straight, bend the body forward until the hands touch the floor. Hold for a few seconds and return to the standing position. Repeat ten times.

(b) Abdominal retraction.—With the back and heels against the wall, the arms to side and the palms forward. Retract the abdominal muscles and tilt the pelvis upward so that the hollow of the back entirely disappears. Repeat ten times.

(c) Body stretching.—With hands on hips and the head held up. Stretch the body up as far as possible (stretch "tall" as it were). Relax and repeat ten times.

(d) Balancing.—With the heels together, the toes turned slightly out, the pelvis tilted upward, the abdomen retracted and the hands behind the head, rise on the toes, bend the knees until the buttocks rest on the heels, keeping the original position of trunk unchanged. Return to the standing position and slowly lower the heels. Repeat five times.

(e) Trunk stretching.—Stand on the toes, one foot advanced in front of the other, the pelvis tilted upward, the abdomen retracted, and holding a wand with both hands high over the head. Keeping the body stretched as much as possible, stretch the wand as high as possible, and walk slowly on the tips of the toes. Take three or four dozen steps in this position.

(f) Body bending and twisting.—With the feet wide apart, the hands high over the head and separated by the width of the head, twist and bend the body, touching the hands to the floor, first to one side then to the other, keeping the arms stretched in line with the head and over the center of gravity of the body. Repeat ten times.

Feet exercises:

(a) Flexion and extension.—Sitting with the legs crossed, alternately fully extended and flex the foot at the ankle. Repeat twenty times.

(b) Foot Adduction.—Standing with the feet parallel and about 4 inches apart, the hands on the hips and the head up. Keep the toes on the floor slightly bent, and roll the knees outward.

(c) Toes spreading.—Sit down and rest the heels on the floor. Extend and spread the toes, then flex into the original position. Repeat twenty times.

(d) Heel stretching.—Sitting with the feet flat on the floor, flex the toes and pull the foot upward and inward as far as possible. Return and repeat with each foot twenty times.

Physical Therapy:

Massage.—By this is meant the scientific application of definite movements by a trained individual, not haphazard, ill purposed kneading by those not versed in the art.

Heat.—Heat may be used in the form of hot applications, dry or radiant heat, or diathermy. The immediate results of its local application are relaxation of muscles, analgesia, relief of spasm, vasodilatation and local and general sweating. Heat is the most easily available form of physical therapy. Its greatest value in correcting faulty posture is in its relaxation of the muscles because, as previously stated, a relaxed muscle more easily responds to new motor coordination.

Light therapy.—Under this heading we include heliotherapy, or sunlight, and actinotherapy or ultraviolet ray. The exposure is to be gradual and if properly carried out the skin is benefited and the general resistance built up, thereby indirectly improving the posture.

Ultraviolet ray therapy also helps to build up the general resistance, but to be of the most benefit in definite conditions, such as tuberculosis and rickets, knowledge is requisite and attention must be paid to the wave-lengths used.

Flatfoot. M. Forrester Brown, M.S., M.D., London, Visiting Surgeon Bath and Essex Orthopedic Hospital; in British Med. J., No. 3714: 463, March 12, 1932.

Any factor which depresses the nervous system as a whole, or the muscles locally (by interference with their blood supply), is liable to cause flatfoot. An anatomically sound foot may thus become functionally incompetent under the influence of: toxins (a) of acute illnesses, especially pneumonia, diphtheria and scarlet fever; (b) chronic sepsis, such as foci in the tonsils or teeth; lack of oxygen; excessive heat—for example in stokers, etc.; excessive cold, general, or more especially local—for example, "trench feet" and when shoes and stockings are too thin; general fatigue from any cause—for example, over marching, standing, hard pavements, shoes unscientifically balanced—for example, those with small high heels; malnutrition (a), general, especially vitamin deficiency—for example, in rickets, poor muscle tone is associated with abnormal lines of stress due to

bone deformity; (b) local, from cramped foot gear.

As regards treatment of the complications, corn must not be referred to the chiropodist for removal until the strain has been removed from the site of their origin, for they are the protection afforded by nature to the affronted bone. When the stress is gone one application of salicylic collodion is usually enough to send them away. A hallux rigidus in a state of spasm must be rested by a spike of strapping in as much dorsiflexion as possible; in the later stages the adhesions must be broken down rigorously till the dorsiflexion is equal to that of the sound side. An early hallux valgus must be treated similarly; a late one demands operation, if symptoms persist after the foot strain is dealt with. After operation relapse can only be avoided by using correct foot gear. Therefore, it is wise, if the surgeon has any care for his own reputation, to insist on this first.

Adhesions should be broken down without an anesthetic whenever possible, to avoid the danger of causing fresh trauma by the use of excessive force. They must be dealt with systematically, joint by joint, and one must never be satisfied until a range equal to that of the good side has been attained, and the patient is able to carry out that full movement himself. The treatment may need several sessions. Each time some swelling and reaction are likely to occur, but they soon go off with hot baths or contrast baths, and, as soon as one reaction is settled, it is safe to begin again. One can do each time as much as the patient will stand. Mennell's method is of great value; namely, to carry out movements across the axis of joints—movements for the performance of which no muscle exists. One must have the patient lying relaxed, so that resisting muscles are not torn. A tight tendo Achillis requires similar handling, but same can only be adequately stretched under anesthesia. One must not forget the importance of inversion of the foot, already mentioned. Peroneal spasm rarely yields without anasthesia, and often it is best to excise over an inch of each tendon, for they unite most rapidly and relapse into spasm. Even after excision, one may be unable completely to invert the foot owing to shortening of ligaments; but symptoms will generally have been relieved, as one finds on removal of the plaster some weeks later. The extreme dropping of the inner side of the foot in some congenital and rickety cases is improved by prolonging the inner side of the heel (but to a greater degree than on the "startrite" shoes); or, alternately, one can use an inner boot of hard leather which has been moulded on a corrected cast of the foot. In very severe and neglected cases, which are stiff and painful—that is, have not a bony ankylosis—it is wise to arthrodese both subastragaloid and mid tarsal joints, thus imitating nature's method of spontaneous cure.

As regards exercises, those done on tiptoe are bad, because they aggravate the shortening of the tendo Achillis. The tibialis anticus and sole muscles require cultivation by lifting marbles, pulling towels, etc. It is then necessary to re-educate the heel and toe walk as revealed by cinema analysis to be the normal.

Treatment of Traumatic Lumbago by Manipulation. F. Romer in British J. Phys. Med., 7:10, April, 1932; abst. in Jour. A. M. A., 99:2:178, July 9, 1932.

Romer calls attention to the fact that the history in cases of traumatic lumbago tells of some definite though frequently slight sprain of the back, requiring perhaps only a few days' treatment for apparent recovery. Instead of perfect recovery, the pain, though rarely severe, never quite disappears, and as time goes on it becomes more persistent. Good results can be obtained by treatment based on the assumption that the condition is due to some adhesions in the muscular or tendinous structure of those parts. On examination the lumbar muscles will often be found wasted, while those on the affected side are usually rigid and contracted, and it may be assumed that it is here that some matting of muscles or adhesions among the deeper tendons exist. Normal mobility is frequently much impaired. Bending the trunk forward will often show that flexion in the region is deficient and not infrequently accompanied by pain. As a rule these cases are unilateral, and consequently lateral movements of the trunk are often impaired. In this condition, treatment aims at stretching the contracted muscles and rupturing any possible adhesions. An anesthetic having been given, the method employed is this: With the patient flat on the back, the leg on the sound side is flexed at the knee and the thigh flexed on the body till the knee touches the chest wall. It is then brought back to the extended position. The leg on the affected side is now put through the same movements, and comparison can be made as to the difference in resistance, which is sometimes most noticeable. Both legs are now brought up together, and both knees should be kept pressed against the chest for about a minute. The legs having been brought to the extended position once more, the patient is now raised to a sitting posture. The operator places one hand firmly on the affected side, while with the other he thrusts the patient back onto the couch; the hand in the middle of the back acting as a fulcrum, causes extension; the trunk is then moved laterally on the pelvis. By these movements, full extension and flexion of the lumbar region is obtained. Pain rarely follows these manipulations, and greater freedom of movement is often experienced immediately afterward; but too much importance cannot be attached to the after-treatment. This consists in radiant heat and skilled massage performed daily for a period of twenty minutes, commencing with light kneading, which can increase in depth as time goes on. Anything like roughness or deep pummeling is to be deprecated. Within the course of about four days, graduated exercises by means of weights and pulleys should be undertaken in addition to the massage.

The Treatment of Rickets. Olin W. Rowe, M.D., Duluth, in Minnesota Med., XV:4:245, April, 1932.

Hygienic Measures

Measures usually included under the term "good hygiene" should not be neglected because of the beneficent effect upon the infant, but it is doubtful if any except sunlight have a pronounced effect on either the prevention or cure of rickets. Lack of exercise in a child that cannot stand can be of little moment in the development of rickets. Massage and salt baths may increase the nutrition of the muscle. Fresh air, while desirable, is without specific effect. Out-of-door life in our latitude cannot be expected to be of value if the atmosphere contains sufficient dust, smoke or moisture to exert a screening effect upon the sun's rays. Changes of climate are beneficial when they make the solar rays more available.

Codliver Oil

Consideration of the several specifics for rickets must give first place to codliver oil.

The proper dosage of codliver oil depends upon several factors, the most important of which is the rate of growth of the infant. As a preventive measure it may be given in five-drop doses to a child of two weeks. This may be gradually increased so that at four months the child is taking one teaspoonful two or three times daily,

depending upon the other antirachitic measures employed. As a curative agent larger doses are necessary. If indicated, a dessert spoonful two or three times daily may be given and is usually easily tolerated at the sixth month.

By far the most potent specific for rickets is irradiated ergosterol. This drug has been known to have marked antirachitic properties for about six years. Its discovery was made during investigations on cholesterol, which was first thought to contain the antirachitic factor. Investigations in chemical and clinical laboratories led to the recognition of ergosterol as a precursor of the antirachitic vitamin. Ergosterol has been known to be a derivative of ergot, a fungus, but nothing was known as to its distribution in the skin and other tissues. When this was recognized it was already known that it could be activated by a small intensity of ultraviolet radiations.

ULTRAVIOLET RADIATIONS

Ultraviolet radiations (290 to 313 millimicrons), a reliable and potent specific for rickets, is associated with the names Huldschinsky and Rollier. The latter was the first to make a definite statement to the effect that sun was the treatment of choice in the cure of rickets. The results are due to a photochemical reaction upon a definite chemical substance. This substance produces many other changes and calcification of the spiphyses easily demonstrated by roentgenograms. The effect upon metabolism as demonstrated by Orr, Holt and their colleagues is an increased retention of calcium and phosphorus.

Ultraviolet radiations are obtainable from direct exposure to the sun's rays and from artificial sources such as air-cooled mercury vapor lamps and the arc lamps.

When heliotherapy is the treatment of choice some consideration as to the number of hours of available sunlight is necessary, as well as an estimation of the quality and intensity of the rays. Unfortunately during the winter months, the period when heliotherapy is most needed, the relation between the sun and the earth is such that only a small part of the desirable band of rays is available. The short rays do not reach the earth and the longer ones are diminished in intensity. Moisture (fog) smoke and dust act as filters. Rays reflected by water or snow and sky shine are valuable. Sky shine has been estimated by Tisdale and Brown as being from one-half to two-thirds as effective as sunshine.

Solar rays when available produce different effects from the more accurately controlled radiations from artificial sources. Clinically this is shown on the skin by ruddier color, and increase of elasticity, and improved texture and a firmer connection with the subcutaneous tissue. The muscles show increased turgor and bony changes (particularly craniotabes) show rapid healing. The roentgenograms are again the most important criteria of progress.

The technic depends upon the month of the year and is wholly empiric not only as to the length of exposure but also as to the amount of skin exposed. It is to be remembered that some of the spontaneous cures of rickets occurring in the spring are in babies who are out of doors a comparatively short time and have only their face and possibly their hands exposed. Our method beginning as early in the spring as the weather will permit is as follows: The legs are exposed for a period of fifteen minutes. The following day the legs are again exposed for the same period and in addition the thighs are uncovered for fifteen minutes. On the third day this procedure is repeated and an additional fifteen minutes of exposure is given to the lower abdomen and buttocks. This method is followed until the entire body has been exposed, until contraindications develop. Over-exposure is usually followed by pallor and fever. The skin of infants varies widely as regards the amount of radiations that can be tolerated without producing the very slight flushing that is desirable. It is well known that blondes are far more sensitive to the ultraviolet rays than are brunettes, but there are exceptions to this rule. Caution must be exercised at the beginning of the treatment. The mothers should be advised that the tan resulting from ultraviolet rays is not the aim of the exposures.

Ultraviolet rays produced artificially are much more easily controlled and much more available in this vicinity than the solar rays. The rays from the carbon arc lamp more nearly approach the solar rays but unfortunately the apparatus has many drawbacks. The mercury vapor light gives a ray of shorter wave lengths than the sun.

The treatment here again is empirical and the same caution is to be used as with solar radiation. Our technic is as follows: The exposures are given to the entire body at a distance of twenty-seven inches. The first exposure is for one minute anteriorly and posteriorly. On the third day the exposure is lengthened to two minutes, if there are no contraindications. The exposures are increased one minute every second day until the child is getting seven minutes anteriorly and posteriorly. It is usually possible in this way to give approximately an hour of ultraviolet radiation in two weeks. The usual precautions are taken to prevent injury to the eyes.

The effect is as remarkable and is as easily demonstrated as with the other specifics. Within two weeks new calcification in the spiphyses and carpal centers is demonstrable with the roentgenograms. Clinically improvement is also readily demonstrable.

Hess emphasizes the fact that neither radiations from the sun nor from artificial sources produce an indefinite immunity. Attacks of recurrent rickets may develop later in spite of a short course of radiation.

Enthusiasm over the results obtained from one tried specific must not permit us to ignore the benefits that can be obtained from other measures. Rarely is it advisable to adhere to one specific in the treatment of any given case. In no instance must our enthusiasm over the treatment of the rickets allow us to overlook the welfare of the patient.

Tuberculosis of the Bones and Joints. Value of Heliotherapy and Surgery as Methods of Treatment. Asa M. Lehman, M.D., Major, Medical Corps, U. S. Army, and Don C. Bartholomew, M.D., Major, Medical Corps, U. S. Army, Denver, in Jour. A. M. A., 98:16:1343, April 16, 1932.

The heliotherapy ward at Fitzsimons General Hospital was opened in 1922. It was built after the plan of Rollier, and the most conservative nonoperative treatment was instituted. Under this form of treatment, the general health, well being, the morale of the patient are improved in a manner that is little short of miraculous. The individual's resistance is raised, the patient, with few exceptions, is able to combat the disease, and recovery is the rule. Our results, however, have not been so startling as those reported by Rollier, and we are forced to conclude that there is some quality in the sun in Switzerland which cannot be duplicated here. In addition, the fact that the majority of our patients are adults no doubt has a decided effect, for it is believed that children react better to this type of treatment than do adults. Be that as it may, the air of healthy, cheerful optimism which pervades our ward is noteworthy.

The question that arises is not so much an evaluation of heliotherapy in the treatment of tuberculosis of joints, but whether or not there is anything that might be added to our present regimen to increase the recovery rate or

shorten the recovery time. This brings us to a consideration of fusion operations.

With the more or less general acceptance of this operation, others were devised, until we now have one or more fusion operations described for every joint commonly subject to tuberculosis infection. Many extravagant claims are made by ardent enthusiasts, such as that the laying of a graft prevents spread of the disease.

In view of such wide differences of opinion, it became incumbent on us to examine carefully our results at Fitzsimons General Hospital. This has been done by a study of the clinical records of all cases treated since 1922. Some of the points brought out by this survey are interesting enough to justify presentation in this form, but first it seems advisable to consider briefly our method of treatment for the various joints.

TUBERCULOUS SPINE

Treatment.—Recumbency on a hard bed is essential. Immobilization is effected by making a posterior plaster trough or boat with the spine in extension. The patient lies on his back in this trough at all times and is rolled once daily for a back rub and bath.

Heliotherapy is started as soon as contraindications can be ruled out, the most important of which are active pulmonary involvement, high temperature from any cause and severe cardiac or kidney disease.

Sun treatments are started gradually, after the system of Rollier, and within a short time the patient is taking two hours daily. The patient is usually kept in bed for at least one year, after which, if all symptoms have disappeared and roentgen examination shows considerable calcium deposit, he is gradually allowed out of bed with the use of the celluloid jacket.

The Albee fusion operation is favored and, in our opinion, should be considered in every adult case. Bony ankylosis is encouraged and hastened by this operation in a satisfactory percentage of cases.

As an adjunct to conservative methods and heliotherapy, the operation has real value and will undoubtedly strengthen the spine and shorten the period of treatment. The indications for the operation are simple. In all adult cases in which no contraindications exist, grafting should be done. The contraindications are wide dissemination of the disease and active tuberculosis of the lungs; in most cases with genito-urinary involvement the operation should be postponed.

RESULTS

Of the 117 patients, 11 (9.4 per cent) died in the hospital or shortly after leaving; 14 (11.9 per cent) are carried as unsatisfactory, making a total of 21.3 per cent in which the results were far from what could be desired.

Ninety-three cases (79.5 per cent) showed definite improvement. Sixty-four cases (54.7 per cent) are carried as apparently arrested, while twenty-nine (24.7 per cent) showed definite improvement and are carried as quiescent.

RELATIVE VALUE OF METHODS

Heliotherapy, combined with conservative measures, has proved itself to be of the greatest value in the treatment. When it is considered that all types and stages of this disease have been accepted (actually many were far advanced), our results are considered highly satisfactory.

Spinal fusion operations are valuable adjuncts to heliotherapy and should be done in all adults in whom no complications exist.

We do not, however, approve of the operation being used as a short cut, and it must be remembered that the patient has tuberculosis after operation. A living graft and a clean operative wound, though greatly to be desired, are not the final objectives. Our ultimate aim is an ankylosed spine, and this requires time by any known method.

TUBERCULOSIS OF THE HIP

Treatment and Results.—As in spinal cases, recumbency on a hard bed is essential. Muscle spasm with its resultant deformity is overcome by extension with weights (usually from 5 to 10 pounds (2.3 to 4.5 Kg.) is sufficient) applied through an anklet and knee band. The angle of the extension is determined by the deformity.

Heliotherapy is given in the same manner as in other cases, and the patient is kept in bed for several months after subjective symptoms have abated, and until considerable healing is shown under roentgen examination. The patient is then allowed out of bed on crutches without any splints or orthopedic appliances of any kind. The absence of muscular atrophy is noteworthy.

After several months on crutches, weight bearing is started gradually, the danger signal here being subjective symptoms. Under this treatment, tuberculosis of the hip will become completely arrested in an almost unbelievable percentage of cases, and weight bearing will be nearly or entirely normal.

Twenty-seven patients were found who had sufficient treatment to make a study of their histories of value. Of this number, two (7.4 per cent) died. One patient died of streptococcic bacteremia following secondarily infected sinuses, and the other of surgical shock from an operation in no way related to the hip. The inclusion of the latter case is hardly fair to our statistics.

Two cases are carried as unsatisfactory.

Bony ankylosis has occurred in all but three of our cases, and only one case showed sufficient motion to be of any value.

Thirteen cases (practically 50 per cent) showed marked active tuberculosis elsewhere, the lungs, spine sacroiliacs and genito-urinary tract being about equally involved.

Success of the Treatment.—Bony ankylosis is the common and the desired end-result in adults.

The recovery rate in our small series of cases approaches the ideal. It would be well nigh impossible to conceive of any regimen that would restore a larger percentage of patients to comparative health.

TUBERCULOSIS OF THE KNEES

Only eleven cases of tuberculous knee have been treated in the heliotherapy ward. Of this number, two must be eliminated because the diagnosis could not be proved.

Of the remaining nine patients, two (22 per cent) died; three (33 per cent) are carried as unsatisfactory, in that the disease remains active in two, and amputation of the thigh was necessary to save life in the third.

Four patients (44 per cent) are carried as satisfactory, and all of these had fusion operations.

Six cases (66 2/3 per cent) showed marked active involvement elsewhere, the lungs, spine and genito-urinary tract being about equally involved.

There has been no single case of proved tuberculous knee cured or arrested by heliotherapy alone. It is involved, to institute some form of surgical treatment to induce bony fusion.

CONCLUSIONS

1. Heliotherapy has proved itself to be of the greatest value in the treatment of tuberculous spines and hips,

but for some unknown reason is ineffective in involvement of the knee joint.

2. Bony ankylosis is the proper citerion of arrested disease in adults and probably in children.

3. Fusion operations are valuable adjuncts in the treatment and should be employed in well chosen cases of tuberculous spine and in all cases of tuberculosis of the knee. Our results in tuberculous hips have been so pleasing that operative measures will be tried only in carefully chosen cases, with the hope that the recovery time may be shortened.

4. The most frequent and fatal complication of tuberculous joints is sinus formation with secondary infection, and all treatment must be planned to avoid, if possible, the formation of sinuses.

The death rate falls to an almost negligible figure if sinuses are not present, and after they develop they become of more clinical importance than the original bony lesion.

The Treatment of Skin Diseases by Physical Therapeutic Methods. George M. MacKee, M. D., New York, in Jour. A. M. A., 98:19:1646, May 7, 1932.

HIGH FREQUENCY CURRENTS

A number of terms have been coined to designate the type of current used or to indicate its effect on tissue. This has led to a confusing and at times contradictory nomenclature. In this article the following nomenclature will be used:

1. Medical diathermy: The use of a high frequency current for medical purposes.

2. Surgical diathermy: The use of a high frequency current for any surgical purpose.

A. Cutting current: bipolar and monopolar high frequency current; obtained from the primary winding of a high frequency transformer.

B. Electrocoagulation: Bipolar and monopolar high frequency current obtained from the primary winding of the high frequency transformer.

C. Electrodesiccation: Monopolar high frequency current from the secondary winding of the high frequency transformer.

One objection to electrocoagulation is the difficulty of accurately controlling the amount and extent of tissue destruction. This may be obviated to a considerable degree by using a bipolar electrode—two needles about 2 mm. apart. With such an electrode, both needles of which are active, the current passes from needle to needle and coagulation is confined to the tissue between the needles. Electrocoagulation can be performed also, with monopolar high frequency current.

General Therapeutic Considerations (high-frequency currents).—Diathermy is far from being a safe method in unskilled hands. Carelessness and ignorance when applied to medical diathermy may result in undesirable injury to the skin and even to the underlying structures.

The intelligent and proper use of surgical diathermy requires a knowledge of the general principles of surgery. Major surgical diathermy is best applied by those who have had extensive experience with scalpel surgery. Minor surgical diathermy is within the reach of most physicians.

When employing electrocoagulation, one must take care not to destroy important normal, adjacent tissue unnecessarily. Also, hemorrhage must be guarded against.

The advocates of the cutting current aver that the incision may be sutured and that primary union will follow. This is true, but primary union often fails. It is less likely to fail if the incision is freshened with scissors, scalpel or curet before it is sutured.

Nearly all surgical diathermy operations require either general or local anesthesia. It is surprising how often physicians will attempt to destroy a small growth (basal cell epithelioma for instance) with high frequency currents without anesthesia of any kind. Without local anesthesia it is usually impossible to do the work thoroughly or properly. In dermatologic practice there are some lesions that require only an instantaneous application of the electrodesiccation current. In such instances an anesthetic is unnecessary. But as a rule, some kind of anesthesia is essential. Surgical diathermy requires the same attention to aspesis as does scalpel surgery. Hypertrophic scars are rather common subsequent to the various kinds of surgical diathermy.

ELECTROLYSIS

A current suitable for electrolysis may be obtained from wet cells or dry cells; or the commercial direct current, if available, may be used.

The active negative electrode is a needle. For coarse work an ordinary small sewing needle will suffice. For delicate work, particularly for hypertrichosis, exceedingly thin needles especially made for this purpose are obtainable. When steel needles are used, it is especially important to be certain of polarity, because with a positive current and a steel needle permanent black marks are likely to occur. For this reason many physicians prefer platinum needles.

The term electrolysis is an old one in dermatology. In the past decade the term medical and surgical ionization have come into use. The latter term is incorrectly used, for surgical ionization is electrolysis—the destruction of tissue with the negative pole of a galvanic (direct) current. The destruction is due to electrolysis, which causes the collection of caustic or destructive chemicals around the needle. Electrolysis is used extensively in dermatologic practice.

CAUTERIZATION

Cauterization may be accomplished with chemicals or with heat. We are concerned here only with heat. The actual cautery (thermocautery) consists of a red hot or white hot object, usually a piece of wire or a pointed metallic instrument.

THERAPEUTIC REFRIGERATION

The term therapeutic refrigeration refers to the use of liquid air or solid carbon dioxide for therapeutic purposes. The skin can be superficially frozen with ethyl chloride as every physician knows, but as a rule the therapeutic use of ethyl chloride is not included in the category of therapeutic refrigeration.

Refrigeration when applied to many conditions, results in a scar; but the scar is always soft, pliable and of excellent cosmetic or esthetic quality. Hypertrophis scars and keloids subsequent to refrigeration are rare.

Formerly, solid carbon dioxide was used as a treatment for a great variety of skin conditions. In this country it is now used mostly for certain nevi, for warts, and occasionally for telangiectasia and lupus erythmatosus.

BALNEOTHERAPY

Medicated baths and wet dressings, especially the latter, are used extensively by all dermatologists. Wet dressings are employed mostly for acute inflammations of the skin, vesicular and pustular eruptions, and exudative surfaces.

Medicated baths, while not particularly efficacious, are used for subacute and chronic eczema, ichthyosis, pruritus, urticaria, pemphigus and other diseases. Bran, oatmeal and starch are employed for soothing baths.

The so-called antipruritic baths are made by adding 8

or 10 ounces of sodium bicarbonate or epsom salt to the water. Various pine products are on the market, also tar and sulphur preparations, for the bath. Sea water or sea salt is often used.

The continuous bath is used mostly for severe cases of pemphigus, when the greater part of the body is covered with bullae, crusts, erosions and vegetations. It is customary to add a grain or two of potassium permanganate to the bath.

Other forms of hydrotherapy are employed very little in dermatology. Many dermatoses disappear during a vacation at some spa, but dermatologists are generally agreed that improvement, when it occurs, is due to changed environment, rest or psychology.

MASSAGE, POSTURE, STRAPPING

In dermatology, massage is employed as an adjuvant in a few diseases. Massage of the scalp is used for local circulatory benefit in the various types of alopecia. Massage is a recognized treatment for keloids, keloidal bands, hypertrophic scars and adherent, hard contracted cicatrices. Massage is one of the best treatments for scleroderma.

Occasionally, massage is indicated for chronic eczema of the extremities, or for any condition associated with congestion and stasis. Often it is combined with special posture as, for instance, elevation of the legs or arms. These measures are used for such disorders as Raynaud's disease and chronic ulcers.

Cutaneous stasis may at times be lessened, and indolent ulcers, especially those having an infiltrated or indurated margin, may be benefited by strapping with adhesive plaster or the wearing of some support for the local circulation, such as elastic stockings or bandages that possess elasticity.

DISEASES AMENABLE TO PHYSICAL AGENTS

Verruca Vulgaris.—Surgical diathermy: Very small lesions, and even larger ones, will at times disappear subsequent to mild electrodesiccation of the surface of the wart.

Common warts can be destroyed with electrolysis and with the actual cautery, but these agents are seldom used for this purpose.

Verruca Plana.—The juvenile flat wart (verruca plana juvenilis) does not yield particularly well to electrodesiccation.

Verruca Plantaris.—Electrodesiccation is an excellent method of destroying these troublesome lesions. The lesion is first thoroughly desiccated by sparks applied from a needle to its entire surface for a minute or two. The wart may then be shelled out and the base and edge of the wound electrodesiccated. Thereafter, the patient has the discomfort of an ordinary wound which usually is much less than that of the wart.

Verruca Acuminata (condyloma acuminatum).—Very small discrete warts may be destroyed with superficial electrodesiccation without local anesthesia. Otherwise, it is necessary to desensitize the involved area, electrodesiccate thoroughly, remove the desiccated lesions with a curet, and then lightly desiccate the wound. The results are excellent.

Keratosis Seborrheica.—Electrodesiccation is an excellent therapeutic method for this purpose, but there are better methods for selected cases. It is, for example, poor judgment to replace a small, superficial, almost benign seborrheic keratosis on the face of a society woman with an objectionable scar.

When a slight scar is of no importance, the surface of the lesion and a little normal skin around the periphery of the lesion may be rather thoroughly desiccated.

Electrolysis, solid carbon dioxide and the actual cautery are used by some dermatologists for the destruction of seborrheic keratoses.

Keratosis Senilis.—Of the various physical agents (excepting radium and x-rays) electrodesiccation is the best one for this purpose.

Nevoid Keratosis.—Electrodesiccation is an excellent remedy for selected cases.

X-ray and radium keratoses occur on the so-called x-ray or radium skin. The most popular method is electrodesiccation.

Tuberculosis of the Skin.—Lupus Vulgaris: Discrete apple-jelly nodules can be destroyed with the actual cautery and with electrolysis, but perhaps the best destructive physical agent for this purpose is electrodesiccation.

Tuberculosis Verrucosa Cutis (verruca necroganica; warty tuberculosis of the skin): Small lesions of this form of true tuberculosis of the skin can be permanently destroyed with electrodesiccation.

Lupus Erythematosus: Before the advent of intravenous gold therapy, solid carbon dioxide was perhaps the best treatment for the fixed or discoid type of lupus erythematosus.

Vascular Nevi.—These are common and may be conveniently divided into four varieties; nevus araneus; nevus flammeus; and angioma, the latter being subdivided into the strawberry mark and the cavernous angioma.

Nevus araneus: The best treatment for the spider nevus is electrolysis.

Nevus flammeus: Repeated strong applications of solid carbon dioxide will remove small lesions, but, of course, such treatment leaves a scar. Electrodesiccation is less satisfactory than refrigeration, and cicatrization is more pronounced.

Strawberry mark: These lesions can be destroyed in various ways—refrigeration, electrodesiccation and excision—but by far the best results are obtained with radium.

Cavernous angioma: Small, compartively superficial lesions can be destroyed with solid carbon dioxide. The resulting scar is of excellent quality. Electrodesiccation and electrocoagulation have been used successfully for small lesions. Multiple insertions of the needle at intervals of a few millimeters are usually necessary.

Senile angioma: These lesions when small, may be destroyed easily with electrodesiccation.

Common Mole: They can be removed with electrolysis with almost no scarring. When potentially dangerous because of repeated traumatism, they may be excised or destroyed with electrocoagulation.

Mouse-Skin Moles: Excellent results have been obtained with solid carbon dioxide, although several strong applications may be necessary. Electrodesiccation is also a good remedy for small lesions.

Flat Pigmented Nevi: The color is important. When of a light brown they are not considered to be dangerous and may be destroyed with solid carbon dioxide. Black, slate gray, brownish-black and especially bluish-black moles of this type without hair, are considered to be potentially dangerous. These necessitate surgical excision or some form of surgical diathermy.

Keloid: Combined with the proper use of x-rays or radium, the surgical methods are invaluable for selected cases. Thick keloids may be removed to the level of the normal skin with the cutting current and the resulting wound treated with x-rays.

Massage is of some value for the treatment of hypertrophic scar tissue.

Scleroderma: Massage with cocoa butter is a useful treatment for this disease. A few cases have improved during a course of treatment consisting of applying medical diathermy to the spine and roots of the spinal nerves.

Cysts.—Mucous retention cysts of the lower lip can be destroyed with monopolar or bipolar surgical diathermy.

Rosacea and Rhinophyma.—Often in rosacea there are a few or many dilated visible cutaneous vessels. Destruction of such vessels lessens congestion, improves the appearance, and may make the rosacea more amenable to treatment. Small vessels can be destroyed with electrolysis, the larger ones with electrodesiccation.

Telangiectasia.—When the vessels are small and not too numerous they may be occluded with electrolysis and if this is carefully done there will be little or no scarring.

Hypertrichosis.—Practically the only way in which superfluous hair can be removed permanently and safely is with electrolysis. The method requires skill, patience and care.

Ultraviolet Theraphy in Dermatology. George M. MacKee, M.D., New York, in Jour. A.M.A., 93:18:1553, April 30, 1932.

In this country, practically all dermatologists employ air-cooled quartz mercury arc lamps for the irradiation of large surfaces and the water-cooled quartz mercury arc lamp for special purposes, purposes that are enumerated later. In Europe some dermatologists employ carbon arcs, some use quartz mercury arcs while a few utilize both types. Many dermatologists prefer the carbonarc because when properly constructed and operated, it provides an intense ultraviolet radiation with a spectrum approximately that of the sun. They aver that radiation of these wavelengths is most beneficial for the treatment of skin diseases.

As yet there has been very little clinical dermatologic experience with the so-called cold quartz lamp which emits intense ultraviolet radiation, most of which is of very short wavelength—about 90 per cent at about 2,537 angstroms. There is the same paucity of experience with especially constructed incandescent bulbs.

Practically all dermatologists depend on an arbitrary standard—the erythema dose. This is determined by experimenting on small areas of the operator's own skin. The lamp is placed at a definite distance from the skin (the distance is measured from the source of radiation). Graded exposures are made to small areas on the flexor surface of the forearm, beginning with thirty seconds and increasing to two or three minutes or longer, depending on the power of the lamp. Erythema develops in a few hours if sufficient radiation has been applied. In this way the time of exposure is ascertained for the particular lamp at the particular distance. All quartz lamps should be tested with a dosimeter or by skin effects frequently so as to compensate by additional exposure time for loss of intensity caused by deterioration of the burner.

For the treatment of some dermatoses it is advisable to apply ultraviolet radiation locally, with or without pressure. For certain other skin diseases, irradiation of the entire body is indicated. This means that for some diseases a water cooled quartz mercury arc lamp is used at various distances from the skin and at times with a quartz applicator for compression. In the absence of a dosimeter or, in fact, in addition to a dosimeter, the erythema dose should be ascertained with and without compression and at various distances, by the simple method previously outlined.

DOSAGE

Large Areas.—When the entire body or an extensive area is irradiated, it is the consensus that the first dose should be very small. In order to avoid undesirable constitutional and cutaneous reactions, the initial dose should not be more than a small fraction of that required to cause erythema in the particular patient. As a rule, with or without the production of tan, toleration increases during a course of treatment. It is customary, therefore, to increase the time of exposure at each sitting.

The frequency with which general body irradiations should be given is debatable.

There are a few skin diseases with fairly extensive eruptions in which an erythema dose may be given with considerable safety and often with good results, such as widespread acne vulgaris and pityriasis rosea; but erythema doses are likely to produce undesirable results in many if not most of the generalized dermatoses that may be benefited by ultraviolet radiation.

UNDESIRABLE RESULTS

Many of the inflammations, especially when acute or subacute (eczema, psoriasis, and the like) may be made more acute and may be made to spread or change character by too vigorous treatment with ultraviolet radiation. For instance, a patch of subacute eczema of any type may change to exudative eczema and may then become more or less generalized (infectious eczematoid dermatitis). On the other hand, the patch may spread over the area of erythema if the normal skin is not protected. When treating individual lesions of any dermatosis, it is advisable to protect the surrounding normal skin. When more or less generalized psoriasis, especially if it is of the more acute or inflammatory type, is too vigorously treated, it may change to universal psoriasis or dermatitis exfoliativa. The same phenomenon is observed at times in cases of eczema. It is admitted that vigorous treatment may at times make large patches of psoriasis and eczema disappear, but such treatment is risky.

Large doses of solar radiation and of artificially produced ultraviolet radiation may precipitate attacks of herpes simplex and lupus erythematosus.

THE PRACTICAL APPLICATION OF ULTRAVIOLET RADIATION

Diseases due partly or wholly to pyogenic organisms.—Acne vulgaris: At least 60 per cent of the patients can be cured with conventional dermatologic therapy in from a few months to a year without recourse to physical therapy.

Erythema or flushing doses of artificial ultraviolet radiation or solar radiation once or twice a week, or daily if toleration is high, will very often cause the eruption to improve or disappear but, unfortunately, recurrence is the rule.

Sycosis vulgaris: Ultraviolet radiation appears to have very little effect on the disease.

Furunculosis and Carbunculosis: Many physicians believe that an erythema dose or a blistering dose of ultraviolet radiation, preferably with a water-cooled lamp with compression when applied to a boil in the very early stage of evolution, will either abort the lesion or greatly modify further development. In the hands of most dermatologists, this procedure has been uncertain and disappointing.

Erysipelas: Good results have been obtained in this disorder with both x-rays and ultraviolet rays. Daily sub-erythema doses of ultraviolet radiation are reported by many physicians as being effective.

Indolent ulcers and wounds: Occasional erythema doses of ultraviolet radiation or daily treatment with

graduated doses of solar radiation or artificial ultraviolet rays seem to be helpful in some cases.

Miscellaneous pyogenic disorders: The evidence is insufficient for an evaluation.

Eczema venenatum: Ultraviolet radiation is not indicated in this type.

Dermatophytosis: Ultraviolet radiation has been advocated, but the results do not warrant its recommendation.

Infectious eczematoid dermatitis: I have had no success with ultraviolet radiation in this type.

Neurodermatitis, circumscribed: A full erythema dose of ultraviolet radiation may be followed by improvement, but the results are uncertain.

Neurodermatitis, disseminates: Certainly many of these patients improve when they are able to indulge in heliotherapy, but it has been impossible thus far to determine whether the improvement is due to a combination of environmental factors (rest, relaxation, contentment, salt water bathing, effect of moving air on the naked skin, change of climate, escape from causative proteins) or to ultraviolet radiation.

Eczema seborrheicum: Occasionally, ultraviolet radiation appears to give good results, especially erythema doses for chronic dry patches.

Eczema hemostaticum: Ultraviolet is not efficacious for this type of eczema.

Many dermatologists claim that ultraviolet rays are useful for many varieties of eczema and in selected cases this is possibly true, but in general terms American dermatologists agree that ultraviolet radiation is not of much value in this disease.

Psoriasis: Ultraviolet radiation in amounts sufficient to cause erythema, applied to the individual lesions about once a week, will at times promote resolution.

Pruritus; Prurigo: Ultraviolet radiation by some is recommended for the various types of essential pruritus but the majority of dermatologists have not been favorably impressed with the results.

Ultraviolet rays have been advocated for the relief of pain associated with diseases such as zoster. They appear to be of little service for this purpose.

Ultraviolet radiation has been used a great deal by a large number of dermatologists and others in the treatment of alopecia. Some believe that it is useful. A greater number think that it is less efficacious than more easily applied topical remedies. There is now fairly general agreement that ultraviolet radiation is in no sense a specific, that it is not a "hair grower." It may be stated that all types of alopecia can be handled as successfully without as with ultraviolet radiation.

Lupus Vulgaris: Ultraviolet radiation has given very satisfactory results in all types of lupus vulgaris.

Scrofuloderma: Satisfactory results have been obtained in many cases of scrofuloderma with and without tuberculous adenitis. The best treatment appears to be adequate attention to the general health, a suitable diet, and daily body irradiation with either solar radiation or artificial ultraviolet radiation, preferably the former.

Actinotherapy in Psoriasis. J. Meyer in Jour. de Med. et de Chir. Pratiq., 103:107, Feb. 10, 1932; abst. in Jour. A. M. A., 98:18:1603, April 30, 1932.

Meyer asserts that actinotherapy is one of the best methods for the treatment of psoriasis. However, no artificial source can supplant the sun, which owes its action in part to its rays and in great part to the general improvement that comes from rest in the open air. The dosage of irradiation is regulated by the electric thermocouple and a (Saidman) skin sensitometer. The ultraviolet rays of the arc or mercury lamp in a medium or moderate dose will clear most of the psoriatic lesions. Topical dressings include chrysarobin and mineral and vegetable tars. No therapy can guarantee absolute cure, although more or less blanching may be attained. It is impossible to prevent recurrences often coming soon after the irradiation.

Methods That Have Proved Successful in the Treatment of Some of the Common and Obstinate Diseases of the Skin. Charles J. White, M.D., Boston, Mass., in Pennsylvania M. J., XXXV:7:443, April, 1932.

HERPES ZOSTER

Locally, experience tells me that there is nothing better than the drying wash composed of phenol. 2; zinc oxid. 8; calamine 8; aq. calcis ad 250, sopped on every hour by means of soft cloth. Far more important than this external treatment, however, is the application of ultraviolet light to the whole circumference of the trunk beginning with two minutes to the front of the chest and abdomen, two minutes to the whole back and two minutes to each side with the respective arms raised. Repeat these maneuvers each day, increasing the time two minutes in each position daily. In the rare instance of zoster within the oral cavity use in addition the modern applicators directly to the intro-oral vesicles.

By the employment of this light we hasten the cure, reduce the accompanying, often acute pain and lessen the chances of the distressing post-zosteriform neurology which may endure for five years, more or less.

One may or may not administer urotropin in five-grain doses after each meal. Personally, I feel this drug has a beneficial effect.

By this method last spring we are able to bring an eighty-nine year old physician successfully through an attack of frontal and ophthalmic zoster.

Solar Radiation in Relation to Endemic Goiter. James H. Smith, M.D., Richmond, Va., in Arch. Internal Med., 50:1:76, July, 1932.

CONCLUSIONS

The data in this section appear to support the conclusions in the three former sections dealing with endemic goiter in the United States, India and New Zealand, respectively, namely, that a deficiency in solar radiation tends to a deficiency of the iodine content of the thyroid gland due to a lack of irradiation of the air, soil, food, drinking water or the skin of the animal organism tending to an increased prevalence of goiter.

In addition, the iodine content of potatoes in districts of South Carolina, according to the distance from the sea, appears to vary with solar radiation during the late summer months, suggesting that solar radiation at this period of the year may have some influence on the iodine content of vegetables.

Ultraviolet Radiation Useful for Therapeutic Purposes. Specification of Minimum Intensity or Radiant Flux; Second Communication. W. W. Coblentz, Ph.D., D. Sc., Washington, in Jour. A. M. A., 99:2:125, July 9, 1932.

Based on six major lines of evidence, I arrived at the conclusion that, in order to insure effective therapeutic results, the intensity (radiant flux density) from sources of heterogeneous ultraviolet radiation, of wave lengths less than and including 313 millimicrons, evaluated according to the spectral erythemic response curve, should not be less than the erythemogenic equivalent of 20 microwatts (200 ergs per second) per square centimeter of

homogeneous radiation of the wave length, of maximum erythemogenic effectiveness, which wave length, for practical purposes, is taken at the emission line of mercury vapor at 297 millimicrons (more exactly, 2,967 angstroms).

Although there appears to be no close relationship between the spectral erythemic response and the spectral activation curve of ergosterol in the production of ergosterol in the production of Vitamin D and in the healing of rickets, the erythemal reaction is taken as a criterion for judging the effectiveness of the lamp, for three reasons: (a) It is practically the only physiologic reaction that is established with a relatively high degree of accuracy; (b) in the case of exposure to intense sources of ultraviolet radiation, it is a simple and practical means of preventing severe burns, and (c) in the case of weak sources of ultraviolet radiation, it is an efficient safeguard against possible fraudulent sale of lamps that are deficient in ultraviolet radiation.

Treatment of Nasal Infections. E. J. Deck in British J. Phys. Med., 7:6, April, 1932; abst, in Jour. A. M. A., 99:2:178, July 9, 1932.

Deck states that in the treatment of nasal infections by the Super-Kromayer lamp the patient should be placed in a dental or similar adjustable chair. The head rest should be one that can be tilted in any desired position. In the absence of such a chair, the patient may be placed in the semirecumbent position on a couch. The nose, if hypersensitive, must be sprayed with a 10 to 15 per cent solution of cocaine. A flat quartz applicator about 2 inches long, and rounded at the end, is next gently inserted into the nostril and pushed slowly up the nose as far as the patient can bear it, while the lamp is kept as nearly horizontal as possible. With a standard lamp, an application of from forty to sixty seconds is then given to each side of the nose. When this is done, the short quartz applicator should be replaced by one about 4 inches long, with flat sides and slightly curved at the end so that it can be readily passed along the lower nasal passages. By gentle handling and accommodation to the curves of the lower nasal passages, this applicator can be easily passed almost into the nasopharynx. When this is accomplished, a similar exposure of from forty to sixty seconds may be given to each side. Treatment as a general rule should not be repeated for at least four days.

Four Years of Daily Measurement of the Ultraviolet Component of Sun Light by the Acetone-Methylene Blue Method. Walter C. Russell, C. W. Howard and O. N. Massengale in American Jour. Hyg., xvi:1:192, July, 1932.

COMMENTS AND SUGGESTIONS

Our experience with this method leads us to suggest that comparative data can be obtained by different observers only when a solution which has a uniform rate of bleaching is used by all observers, when a uniform method of placing the tube is adopted and when attention is given to temperature effect. More accurate readings could be obtained if a standard clear quartz tube of uniform inside and outside diameter were employed and if the color standards were contained in tubes identical in dimensions and material with those used for observations. The variety of sizes of quartz tubes now available and the use of glass tubes for the standards make accurate comparisons a difficult matter in some instances. As has been suggested by other observers, a more critical study of the temperature coefficient should be made. It would also be of value to know whether the rate of bleaching is the same throughout the scale of units from 10 to 3.

SUMMARY

The results of daily observations of the bleaching of the acetone-methylene blue reagent by sunlight are reported for the period August 1, 1926-July 31, 1930, at New Brunswick, New Jersey.

The relation of these observations to the hours of sunshine is discussed. A comparison has been made with date reported by observers in other parts of the world.

An approximate temperature coefficient has been determined for the conversion of readings made at winter temperatures to a summer temperature basis and the curve for temperature effect discussed.

The percentage transmission of ultraviolet transmitting material, Cel-O-Glass, was studied using the acetone-methylene blue reagent.

The acetone-methylene blue data are correlated with the effect of sunlight on bone formation.

Acceptance of Sunlamps—a Preliminary Report. The Council on Physical Therapy of the American Medical Association has authorized publication of the following report.—H. A. Carter, Secretary.

In accepting sunlamps, the attention of the profession is called to the following:

A. The Council on Physical Therapy definitely withholds acceptance of the postulatory principle of dual-purpose lighting, because it is highly theoretical and the promulgators of this idea have not presented acceptable clinical evidence to the Council substantiating its therapeutic of prophylactic value.

B. The Council on Physical Therapy declines to accept sunlamps if the manufacturer fails to state in all advertising matter and descriptive literature the distance between the lamp and the recipient required to equal the intensity of midday, midsummer, midlatitude, sea level, natural sunlight. Thus, in the acceptances that follow, the reader will note that the manufacturer has stated the distance the recipient should be from the sunlamp to receive the alleged benefits.

C. The manufacturers of acceptable sunlamps for home use have agreed to discontinue the objectionable claims such as that exposure to ultraviolet rays increases or improves the tone of the tissues or of the body as a whole, stimulates metabolism, acts as a tonic, increases mental activity, maintains health, or tends to prevent colds, because these claims have not been conclusively substantiated by experimental evidence.

D. The Council declined to sanction claims recorded in descriptive literature and advertising matter in which implication is made that the production of an erythema is unnecessary as a test of intensity; that suberythemal doses are sufficient for therapeutic benefit. The Council believes that, while such statements may be made in good faith, they merely open the way to fraud by irresponsible venders of alleged sources of ultraviolet radiation. Until further evidence is presented to prove otherwise, the Council declares that the erythema test is the only means of determining whether appreciable ultraviolet is emitted by the source.

Treatment of Chronic Suppurative Disease of the Middle Ear. J. D. McLaggan, M.A., F.R.C.S., Surgeon General London Throat, Nose and Ear Hospital; Surgeon in Charge, Ear, Nose and Throat Department, Croydon General Hospital; Assistant Surgeon Ear, Nose and Throat Department, Royal Free Hospital; in British Med. Jour., No. 3732, page 94, July 16, 1932.

DISEASE OF THE TYMPANUM

In the fourth type of case the disease is limited to the middle ear or tympanum itself. There is frequently a history of an ear which has been the site of a recurrent eustachian infection, the source of which has been cleared up; but discharge continues from the swollen, infected mucous membrane of the tympanum. It has no bad odors, but annoys by its persistence. Examination of the ear shows a central perforation of the drum—that is to say, it involves the membranous part of the drum only, and does not encroach on the bony tympanic ring at any point. I do not mean that the perforation is small: it may involve a very large part of the drum. The mucous membrance of the inner wall of the middle ear can be seen through the perforation, and is usually oedematous, juicy and succulent. Care over a long period (drops and keeping the ear clean) usually leads to a cure. It is, however, extremely difficult to teach the patient to keep his ear clean, and economic considerations prevent daily visits to the doctor.

TREATMENT

It is in this type of case that we have in ionization a most powerful ally. Ionizing an ear is a process which is easily performed. The ear is first scrupulously cleaned by syringing or mopping and by sucking away the last vestige of discharge from the middle ear by means of a suction speculum. The middle ear and external meatus is then filled to the top with a zinc sulphate solution. Into this pool is introduced a vulcanite speculum down the center of which runs a metal electrode. The electrode is attached to the positive pole, the negative pole being attached to a flat electrode applied to an arm or leg. A current of from 2 to 3 milliamperes is passed for ten to fifteen minutes. The whole process is completely painless and can be carried out in very young children without the slightest trouble.

Care is required in working up the strength of the current slowly to the maximum to be used, and similarly at the end of the time in decreasing the current equally slowly. Any quick alteration in the strength of the current will produce giddiness and sickness, due to stimulation of the semi-circular canals. When it occurs it is best dealt with by making the patient lie down flat and quiet. It passes off in about a quarter of an hour. For this reason ionization should never be tried in a case in which there is well marked history of giddiness, as there may be an erosion present involving the wall of the inner ear and rendering the patient particularly susceptible to such attacks.

I have also found it is not without risk, and when it is applied to the special type of case which I have described the results are excellent. With one or two applications the discharge dries up entirely. It has the great advantage of taking the treatment out of the hands of the patient and his home, where it is usually very inefficiently carried out, for after ionizing no treatment at all is required until the ear is inspected again at the end of two or three days.

Underlying Factors In Zinc Ionization Treatment of Middle Ear Infections. D. M. Lierle, M.D., in Ann. Otol. Rhinol., and Laryng., xli:2:359, June, 1932. (From the Department of Otolaryngology and oral Surgery, University Hospital, Iowa City, Iowa.)

The treatment of middle ear infections with zinc ionization, resulting in varying degrees of success, has been reported on numerous occasions. The treatment is designed to destroy bacteria and to stimulate the repair of tissues. In certain selected patients at the University Hospital, particularly those showing persistent aural discharge following radical mastoid operations, this form of therapy has been fairly satisfactory. Several years ago, however, it became evident that the use of the electric current apparently had little to do with the results attained.

The purpose of this investigation has been to determine the effects of zinc sulphate upon bacteria, with and without the electric current, and also to study the extent of the electroplating of tissues during ionization, as has been reported by several authors.

On the supposition that zinc remained in the tissue, a number of experiments were made to find out to what extent this occurred. First, x-ray pictures of the ionized tissue were taken. The results were negative, showing no deposition of metallic zinc probably because the particles, if present, would have been of such minute size that the emulsion of the film would have obscured them.

A second group of experiments involved the electrolysis of zinc sulphate solution in a tube in which the cathode was separated from the anode by a silica gel bridge. The same current as advocated in the usual treatment and even three times this current was applied in these experiments. No metallic layer was visible.

The third method of approach was the qualitative chemical analysis of tissue following ionization of the tympanic cavity. The patient (M.P.) had received the ionization treatment twice prior to the operation, the second treatment being given about four hours before the removal of the tissues. The tissue equalled in mass an average size garden pea. It was digested with sulphuric and nitric acids, brought to a pH of 4.6 with sodium hydroxide, and the precipitation of zinc as pyridine thiocynate was carried out according to the method of Pagel and Ames. No precipitate, indicating the presence of zinc, was visible even after four hours standing.

Lastly, analysis of ionized tissue by the spectrograph was done. The infected membrane from the frontal sinus of a dog was selected as a suitable area for experimental study of the ionization treatment. The area was ionized in the usual manner, and the excess zinc sulphate was washed out with normal saline to remove any zinc occluded by the tissue. The infected membrane was then removed and put into a pyrex flask for digestion. The other frontal sinus was used as a control and was treated in the same manner as in the experiment just described. This time, however, no electric current was used. The sinus was filled with zinc sulphate solution and allowed to remain for the usual twenty minutes. The membrane was then washed with normal saline as before and an equivalent amount of tissue removed.

Both ionized and control samples were digested with sulphuric and nitric acids until a colorless solution was obtained. These samples were analyzed for the presence of zinc by Mr. D. C. McCann of the department of analytical chemistry, who employed the spectrographic method. The analysis of the tissue shows the following: There is only one line in the plate which might be assigned to zinc—the line at 2771 A. Since this line is no more persistent than the others indicated, there is no reason to believe it is zinc.

Should the above line be due to zinc, since it occurs in both the control and the electrolyzed tissue, it would probably be due to traces of zinc in normal tissue, as in the case of the calcium and magnesium shown.

SUMMARY AND CONCLUSIONS

The possibility of the deposition of metallic zinc

in living tissue is remote and open to question.

The spectroscope is particularly adapted to the detection and estimation of small amounts of zinc in tissue.

The use of small electric currents in the treatment is of doubtful value so far as the bactericidal effects are concerned.

The value of zinc sulphate as a bactericide has been studied. The beneficial effects of the treatment are probably due primarily to the destruction of bacteria by the zinc sulphate; the effect of the current is of slight importance.

The Early Care of Burns and the Repair of Their Defects. Vilray P. Blair, M.D., James Barrett Brown, M.D., and William G. Hamm, M.D., St. Louis, in Jour. A.M.A., 98:16:1355, April 16, 1932.

Fig. 2—Hypertonic salt bath: The tube is padded and has supports for the head and feet. The bath is kept comfortable by frequent additions of or a continual flow of warm water, and up to 5 per cent sodium chloride may be added. Cleanliness is important, but no attempt is made at sterility. For adults a large hydrotherapy tube (used for neurologic patients) with a canvas sling in which the patient lies, with arms and legs free, is ideal but not necessary. When a fatal outcome is expected, this method of care is one of the most comfortable and may be continual. If the patient cannot be moved about easily, both the bowel and the bladder content may be passed into the tub, cleaned out, and fresh saline solution added. For patients who are first seen with badly matted and stuck dressings and clothing (and who are often unapproachable), soaking in the bath is probably the best, quickest and least painful method of loosening the dressings and crusts. The clothes and dressings may be cut away with the patient still in the bath. Active mechanical cleansing of the wound should be done at the time of each bath, and in this way the area may soon be as free of debris as though an immediate deep debridement had been done. The patient in this illustration was put in the tub when first seen, after having fought and screamed considerably, but was comfortable within ten minutes and asking for food. She was put in from two to three hours each morning and frequently slept part of the time. Some one should be in constant attendance for children.

At the time the catastrophe occurs, any treatment that lessens shock and controls pain is good treatment, and then tanning is much better than the use of unguents. If the devitalization is not too deep for their penetration, the early use of tannic acid or other fixative may be all that is necessary, for it relieves pain and limits both infection and absorption. However, after a deep burn the production of pus is prone to become active in the plane of contact between the living and the dead tissue, unless inhibited by some artificial means.

If the burn has destroyed the full thickness of the skin or more, we prefer to rely on the protective and reparative faculties of the live tissue rather than on chemical control of the dead tissues, not only because in these deeper burns the quick may be too deep to be reached by surface applications but also because, when successful, complete fixation retards the natural sloughing off of the dead tissues and thus delays the opportunity for surgical repair.

The fighting forces of the surrounding tissues are aroused, drainage is facilitated, and pain is allayed by warm moist applications; plain water, physiologic solution of sodium chloride or a mild antiseptic may be used, but a hypertonic salt solution seems to have special virtues. By its use, most burned areas can be made sufficiently clean and the granulations sufficiently firm for grafting, within from three to five weeks. By this time all the damaged tissue except seared tendons and bone will have been spontaneously thrown off and, if the general health has been maintained, a firm scar bed supporting a healthy crop of firm granulations will have formed. The yellow scar base that is found over the area after these granulations have been sliced off makes an ideal bed on which to grow Ollier-Thiersch or thicker split skin grafts. This method of disposing of the burned tissue is a slower process, but we believe that it is surer, safer and more conservative of tissue than an immediate debridement, and it can be carried out in the home.

Fig. 3.—Method of using dry heat and no dressing. Electric lights supply warmth. By having them placed high and spreading the sheets over the whole bed, easy access to the patient can be had by the nurses, and the patient has as much freedom of movement as any one in bed. The lights may be placed across the top of a Balkan frame or a special frame may be made to fit adults' or children's beds. If there is much infection and crusting, the patient may be put on a Bradford frame, which is elevated to allow irrigating fluid to run off through the rubber sheet over the end of the bed into the bucket. Every hour or so from 500 to 1,000 cc. of saline solution is poured over the patient. Surgical solution of chlorinated soda, acriflavine hydrochloride, hexylresorcinol, or any other desired antiseptic may be applied on loose gauge dressings. Any adherent gauze is left in place to be soaked loose in the next bath.

The patient is left free of tractions or restraints. Traction aimed at prevention of scar contraction, as usually applied, is practically useless, is very discomforting, and is, we believe, a mistaken aim. Normal active full range movements are encouraged (and rewarded) and in this way many secondary contractures may be overcome or avoided, even though there may be severe contracture in the burned area. If the finger nails are kept short and clean, there is not much damage done by the picking of the wounds and crusts that the children are apt to do. The change of treatment each day is good for the patient's morale and, as soon as possible, the burned areas are covered with the water-soluble jelly containing from 2 to 5 per cent sodium chloride on gauze, so that the patient may be up and around. This is left on until the following morning, when it is soaked loose in the bath. This tent arrangement of the bed may be used for practically all badly burned patients, if the wounds are to be left open as in the tannic acid treatment. In many instances the use of the salt bath and dry heat may suffice for the original care of the burn.

Patients who have long endured the pain and discomfort of large infected raw surfaces are apt to be intolerant of the dressing of the wounds. Their general health is made still worse by lack of local care, with resultant bedfastness, loss of rest, loss of weight and probably, worst of all, loss of morale. Such patients will require for their reclamation time-consuming local and general care and the utmost patience, tempered with morale-restoring firmness. Efficient nursing care may be the deciding factor in preserving the patient's life.

For these we have found that the salt bath alternating with periods of dry heat is the most comfortable treatment. Children who have lost their entire con-

trol at the thought of a dressing have been restored by two or three hours a day in the bath (Fig. 2). When out of the bath, they are kept in bed without dressings under a warm tent, heated by electric light globes overhead (Fig. 3). Others have used this plan, which is simply an application of accepted surgical principles in the care of infected wounds, and no originality is claimed in advocating it.

Hardening Procedures and Upper Respiratory Disease—(Common Cold). William F. Gafaffer in Amer. J. Hygiene, xvi:1:233, July, 1932.

It is frequently stated that a procedure such as sleeping in rooms with windows wide open, or systematic outdoor exercise has a certain hardening effect on the organism such that a reduction in the frequency or severity of upper respiratory disease (common cold) results. This paper has for its object the determination of the presence or absence of association between these procedures, first, frequency, second, severity, and third, type of attack of upper respiratory disease in a group of over 300 of the adults that agreed to participate in a study of the common cold.

SUMMARY

Over 300 adults were observed for thirty-five weeks from September 29, 1929 to May 31, 1930, when every effort was made to secure reports of all attacks of upper respiratory disease (common cold).

The group that during the winter slept with windows partially open, the group that slept with windows wide open showed no significant difference in respect of (a) frequency, and (b) severity of attack of upper respiratory disease (common cold). In respect of type of attack it was found that of the two groups the second (wide open windows) suffered relatively (a) fewer attacks with coryza and sore throat, and no cough (cor. 4CC - ST 4), (b) more attacks with coryza, cough and sore throat (cor. 4 C 4 ST 4) and (c) more attacks with cough.

The group that exercised outdoors less than eight hours per week during the summer, and the group that exercised eight or more hours per week, showed no significant difference in respect of (a) frequency, (b) severity, and (c) type of attack of upper respiratory disease (common cold).

The group that exercised outdoors less than four hours per week in the winter, and the group that exercised four or more hours per week, showed no significant difference in respect of (a) frequency, (b) severity, and (c) type of attack of upper respiratory disease (common cold).

The Substances Involved In the Coagulation of the Blood In the New-Born. II. The Effect of Ultraviolet Radiation and Viosterol. Heyworth N. Sanford, M.D., T. H. Gasteyer, M.D., and Lois Wyat, B.S., Chicago; in Amer. J. Dis. Child., 43:3:566, March, 1932.

Ten new-born infants were exposed to ultraviolet radiation by means of the air cooled mercury vapor quartz lamp of 110 volts, 60 cycles and 10 amperes. A voltage of 70 was always administered and maintained throughout the exposure. The dorsal and ventral surfaces were exposed for two minutes each day, and the time increased one minute a day until the length of exposure was eight minutes.

Next ten new-born infants were given three drops of viosterol in oil 250 D on the second day, and the dose was doubled each day until 96 drops was given; this dosage was used for two days.

The bleeding time, coagulation time, number of platelets, antithrombin index, prothrombin index and fibrinogen count were determined as has been previously described.

In the viosterol series the results were similar to those obtained with ultraviolet radiation, but they were much more irregular. The fibrinogen was affected to the greatest degree, being consistently high, but the effect wore off rapidly even with much larger doses.

Either exposure to ultraviolet radiations or the administration of viosterol 250 D, or both, will, in the new-born, tend to increase the fibrinogen of the coagulation substance to a slight extent, and to decrease the antithrombin, thereby increasing the tendency of the blood to clot.

Some Factors Determining the Insensible Perspiration of Man. Francis G. Benedict, Ph.D., and H. S. Halcro Wardlaw, D.Sc., Boston, in Arch. Int. Med., 49:6:1019, June, 1932.

The insensible perspiration has long been a matter of scientific curiosity, for as far back as 1614 it was the subject of investigation by Sanctorius in what were probably among the first quantitive measurements of human metabolism. The number of papers that have dealt with insensible perspiration within the last few years indicates a revival of interest in it, and renewed endeavor to interpret its physiologic significance and an attempt to explore the possibilities of its clinical application. Experiments have shown that most of the loss in weight (85 per cent) of the human body by insensible perspiration is due to the evaporation of water from the respiratory surfaces and from the skin, and that within certain limits approximately 25 per cent of the total heat loss from the human body is abstracted by the evaporation of water from its surfaces. On these effects has been based the application of measurements of insensible perspiration to the study of energy metabolism.

SUMMARY

When measured under the usual conditions obtaining in basal metabolism experiments, the rate of insensible perspiration of an adult man became constant within thirty minutes after assumption of the lying position.

Changing from the lying to the sitting position caused an increase of 20 per cent in the rate of insensible perspiration under the special experimental conditions.

Sleep during the day time had no significant effect on the rate of insensible perspiration. Sleep at night lowered it markedly.

About 15 per cent of the total loss of insensible perspiration was due to the loss from the surfaces of the hands and feet. Of the total skin loss, thirty per cent was derived from the surfaces of the hands and feet.

The rate of loss from the hands and feet was approximately three times greater than from the rest of the skin per equal unit of skin area.

Heating of the feet increased the loss of insensible perspiration considerably.

Non-Specific Therapy In Mental Disorder. T. C. Graves, B. Sc., M.D., Lond., F.R.C.S., Eng., Medical Superintendent of Rubery Hill and Hollymoor Mental Hospital, and Chief Medical Officer to the City of Birmingham Mental Hospitals Committee; in The Lancet II:II:57, July 9, 1932.

THE THERAPEUTIC ROLE OF INDUCED PYREXIA

Pyrexia is usually such a striking result of non-specific agents that the benefit following their use is

usually ascribed to the heat produced in the tissues rather than to the agent and the associated focal reaction. In our series there were patients who seemed to improve in direct relation to the pyrexia they experienced, but there were others who did not improve, although they had similar rises of temperature; some of them were actually worse. Yet these same cases recovered later when their foci were treated surgically, with or without non-pyrogenic non-specific therapy. The pyrexia induced is not high enough to destroy the organism in sceptic foci, and consideration of these cases has led us to take the view that the pyrexia itself is not the cause of the recovery. It is merely the response of the heat regulating mechanism to the real therapeutic factor—the non-specific agent. It is an indicator of the activity of the agent and a measure of the efficiency of the heat mechanism. That efficiency can be reduced in toxemic conditions, so that the grade of pyrexial response indicates the severity of the general toxaemia. The resolution of sceptic foci may be followed by improved efficiency in the heat mechanism, and this improvement is often associated with general metabolic improvement, and so with improved mental capacity.

Index to Current Literature on Physical Therapy

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MASSAGE

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Circulatory Disturbance of the Lower Extremities. Louis C. Jensen, M. D., Minneapolis, Minn., in Med. Bull, Vet. Admin., 8:5:381, May, 1932.

American Academy of Physical Therapy

The Annual Convention of the American Academy of Physical Therapy will be held at the Hotel Walton in Philadelphia on Oct. 12, 13 and 14.

The program will contain papers by Doctors Miletus Brown Jarman of Hot Springs, Virginia, Otto J. Sieplein of Miami, Florida, William H. Schmidt, Frank H. Krusen and Benjamin Ulanski of Philadelphia, William Martin of Atlantic City, Harold D. Corbusier of Plainfield, New Jersey, John F. Holland of Trenton, Grant E. Ward of Baltimore and many others.

Discussion will be by Doctors R. Tait McKenzie, Byron S. Price, William L. Clark, William D. McFee, Joseph H. Adams, C. F. Roche, Arthur H. Ring and others. Emphasis will be placed upon the value of Sun Therapy. Dr. William H. Watters of Boston and Miami is in charge of the program.

Clinics will be held at the various hospitals. There will be a manufacturers' exhibit.

Book Review

Coulter, John S., M.D.: Physical Therapy, Cleo Medica, Vol. VIII, Paul B. Hoeber, Inc., New York, 1932. Price $1.50. (Editor's Preface; Author's Preface; Chapter I, Physical Therapy from Ancient Times to the Renaissance; Chapter II, Massage and Exercise; Chapter III, Water; Chapter IV, Electricity; Chapter V, Radiant Energy; Bibliography; Index of Personal Names; Index of Subjects.)

In this rather quaint little red book, one of a series of medical primers, is traced the history and development of physical therapy from ancient times to modern. Dr. Coulter must have had an enjoyable as well as an arduous task to cull and compress into 124 pages the outstanding contributions to this branch of medical science. In a chapter each he has sketched the growth of the primary modalities in such a manner that a layman would find as much of interest as the professional reader. We cannot notate here the pioneer work of men whose names are familiar to all workers in physical therapy but it was with something akin to amazement and awe that this reviewer read of the work of Paul of Aegina, John Hunter, Christian Gottlieb Kratzenstein and Nicolas Andry. Amusing too are the records of quacks who flourished then as well as now.

The type, illustrations and general make up contribute to the historical atmosphere. With its careful indices and references it is altogether a handbook one would be proud of adding to his library.

In closing it might be well to quote from Réné Descartes (and Dr. Coulter) "that all at present known . . . . is almost nothing in comparison of what remains to be discovered; and that we could free ourselves from an infinity of maladies of body as well as mind."

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Credit toward a degree will be granted for this course in the School of Education of Northwestern University.

Special emphasis will be placed on Physiology, Pathology and Anatomy, in which there will be lectures, dissection and quizzes. Special instruction and many hours of practical work will be given in Massage, Muscle Training and Corrective Exercise, especially in the treatment of the various forms of paralysis, spinal curvatures, faulty postures, fractures and industrial injuries. Instruction and practical work will also be given in Electrotherapy, Natural and Artificial Radiation, Hydrotherapy, Occupational Therapy, Physical Therapy Department Administration, and Administration of work for the handicapped.

The course will be under the direction of John S. Coulter, M. D., Assistant Professor of Physical Therapy, and Miss Gertrude Beard, R. N.

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